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OWING to the pressure on our columns we are obliged to postpone the publication of a suitable obituary notice of the late Doctor Joseph Sargent, President of the Worcester (Mass.) Gas Company. We wish to return thanks to Mr. Wetherbee, of Worcester, and to Mr. Sherman, of New Haven, for courtesies received in connection with this matter.

The market for gas securities is also crowded out.

THE TORONTO MEETING.

All things come to those who wait, and so it happened that the day and hour for the Toronto gathering of the American Association finally appeared on the calendar and was ticked out by the timepieces of the waiting gas men. And the fraternity had reason, with more than ordinary desire, to anticipate the occasion of their Sixteenth annual convention; for were they not (at least the great majority) about to invade a strange land and to commit themselves, for the time, to a stranger's care? Later on we shall see how they fared at the hands of a stranger.

The New York contingent, undismayed by the leaden skies and sturdy downpour of a heavy October afternoon, gathered in force at the Grand Central Depot ready for the signal to board the "Special" which was to carry them on to the scene of their labors in Canadian Toronto. As railroad folks never fail to move trains promptly—save when one appears to have on his hands an extra time allowance—the "Special" glided out without delay, and then the party was *en route*. At Albany the Eastern contingent and their "Special" joined forces; and as none but gas men were on guard, the story of the smoothness of the trip is told. The stop-over at Niagara being duly punctuated—in a far from gladsome state of atmospheric condition, however—the Canadian invasion may be said to have been formally begun. The only belligerent attitude or experience thus far to be recorded must be connected with certain officials who protect the Dominion's tariff for revenue only; and even if these occurrences were as salt to those most directly concerned therein, they were as saccharine to others who could properly "declare" the nature of their baggage. As all's well that ends well, the visitors finally pacified the demands of the customs men, and eventually found themselves at the Rossin House headquarters. The usual preliminary scenes at gatherings of this nature were repeated once again, which leads us to remark that the fraternity of gas men seems to become more pronounced as time goes on. And what about the strange land and solicitude of a stranger's care? Well, all we have to say in regard thereto is that Canada and genuine hospitality, coupled with hearty friendship, must hereafter stand for synonims. No words of ours can be adequate in expressing the heartiness of a Canadian welcome.

Passing on to the meeting, and remembering the severe accident that had but a short while ago befallen President Turner, it was with a thrill of thanksgiving and joy that his appearance in the chair was greeted. Sorrow enough was surely the portion of the Association when it recalled the stern fact that five true and tried ones had during the interval of meeting been laid at rest; hence from the gloom burst forth the ray of comfort that Mr. Turner had been spared. The attendance was large, representative and characteristic—thereby setting at naught the doubters who feared Canada and the cold weather—although some were missed, and sadly, whose familiar greetings would have been most warmly welcomed. That the Association's muster roll grows longer it is unnessary to add; and, as the record shows, the Toronto progress in this respect will not suffer by comparison with that of other years.

The report of the Executive Committee, while it revealed the literary treat in store for the members, also conveyed to us some personal disappointment, for it failed to show that any competition was likely to be made for the prize (contributed through us to the Association on behalf

of a Scotch gas engineer) offered at the suggestion of last year's Executive Committee, for the best paper on the subject of "Naphthaline" that might be presented to the Association. However, as the attempt failed, perhaps some other disposition of it may terminate successfully.

Not a small meed of praise should be awarded the Executive Committee, for its labors were evidently arduous, from their diversity, if for no other reason, and every item received careful attention. We would like, however, to have seen more time devoted by the Association to the digestion of that portion of the report referring to the substitution of a new Constitution for the old one which had served its purpose well for 16 years. And served it, too, without any such amount of patching up as it appears some of the members thought had been made on it. If we mistake not the new instrument is likely to be subjected to a far greater remodeling than ever fell to the lot of that it replaces. To dispose at once of the routine business, which was carried along in a perfectly smooth manner by President Turner, whose rulings were made with the promptness of a veteran Parliamentarian, it may be said that the general order of the programme was very closely adhered to. Secretary Humphreys, it need not be said, was the same officer that he has been; and now that the routine duties of his position—which, by-the-way, grow heavier year after year—are thoroughly mastered, it is pleasing to note that the Association does not permit that mastery to interfere with their appreciation of them. Hence the addition to his salary must be considered an appropriate act and a graceful compliment as well. Before taking leave of routine matters we feel that due mention of the work performed by the special committee appointed to devise a system of standard meter unions, should be made. On its face the concise and intelligible presentation of the results of their labors reveals but little concerning the amount and nicety of the work involved in the making ready for the figures on which their decision rests. Session after session of this committee was held within the twelvemonth, and much time and money consumed. In fact we are not so sure but that the Association, apart from any consideration of gratefulness which it may entertain towards this committee, ought to weigh the propriety of reimbursing the committee for certain expenses incurred, not rightfully chargeable to the manufacturers who composed the committee. Of course, we wish it distinctly understood that the responsibility for this suggestion is to be charged directly and solely to ourselves. In any event, the Associatiou is to be congratulated on the impulse that actuated the formation of the committee, and the committee deserves the heartiest applause for its studied, wise and conservative course.

Turning now to the President's address, and to the few preliminary words that he uttered by way of apology for it, we are led to inquire, "If this is the result of Turner's thought when beset by bodily ills, what might we expect from Turner free from bodily ailments?" Perhaps it is because of our hearty agreement with every conclusion advanced by him that we are thus led to exclaim; but not being given to shout with wonder at the appearance of every faithless phantom whose flight may lure one to his doom, it is more likely that our pleasure arises simply from having heard a sound, hard-headed business man calmly advise his fellows to a course that may be dubbed by the admirers of each phantom as ultra-conservative. We have had no reason to change the opinion put forward two years ago by us in the matter of gas companies engaging in the supply of electric light. Mr. Turner, therefore, we think clinches the nail in this statement: "Local circumstances and conditions will generally settle the policy of consolidating the two interests, and wise managers will be governed by the circumstances rather than by the policy of endeavoring to monopolize the entire business of supplying artificial light." And this, perhaps, applies with greater force to the purveying of incandescent lighting rather than to that of the arc type. It is unnecessary to bespeak for President Turner's address the homage of a careful perusal; and we might add that he who scans its opening lines will not take leave of it until the final period is encountered. It is in all respects an admirable paper.

Passing on to the papers, it was of course easy to foresee that all would be of interest, from the very nature of their titles, coupled with the qualifications of the gentlemen who were to present them. The Sage of Indianapolis, fresh from his encounter (victorious, of course, on his part) with the City Fathers, being not only an observant but a retentively observant man, could not fail to know how to handle the subject assigned him—although we must fain confess to sharing in some degree, when the title of the paper was first announced, the idea subsequently so well expressed by Mr. E. J. King, that it would be hard for the Sage to know where to begin or where to cease. That he disarmed both horns of that dilemma is neatly shown in the meatiness of his discourse. At the present writing we will briefly refer to but two of the remaining papers—those by Messrs. Mayer and Perkins. Mr. Mayer's theme was most aptly chosen by the allotment committee, coming for exposition, as it did, at a time when the gas world was engaged in debating the possibility of an important advance in gasholder construction in general. Mr. Mayer, of course, knowing his subject well, spoke on it accordingly. And so it was with Mr. Perkins, whose interesting array of facts and figures, even after being carefully perused now, will often be conned over in the future. It was not, however, our intention to refer particularly at this time to the intrinsic merits of the Mayer and Perkins papers, but rather for the purpose of pointing out how each writer, although possessed of large commercial interest in the respective matters treated of, managed to discuss his theme without allowing that commercial interest to pervade or even obtrude itself. In other words, neither tried to tout his wares, but rather aimed at instructing his hearers. This shows that papers *can* be written on class subjects—if we may use the term—without the taint of the shop being hidden (?) in their lines.

The meeting, take it all in all, was most successful from a technical point of view, although we are sorry that—and we firmly expected it would be—President Turner's reference to the policy to be pursued in respect of the electric light was not reported on, by the committee on the address, in such shape as would subsequently bring the entire matter before the Association for free discussion. We know of one Eastern man (fully qualified from experience to speak) who was fortified with data to make the attempt to controvert the position assumed by the President; but there were others also present just as strongly fortified with like argument in his favor. Still, as the matter stands, we must accept the ratification of the address by the Association as its sense of its findings. And right here permit us to emit our customary growl. Cold water is undoubtedly a good thing in its way, and one expects to look for such in a Temperance Hall; but the combination of cold water and a cold room is, to say the least, depressing, if not chilling.

But if Temperance Hall was slightly too cool for comfort, the Rossin House hall of banquet, on the evening of the second day, more than made amends for the rigors of the meeting room. Canadian hospitality, eh! And in the care of a stranger—ah! May it often be our lot to enjoy the one and have to trust to the mercy of the other. Mine host of the Rossin knows his business truly, but he is to have no especial credit for the grand success of the Toronto banquet, since he was given *carte blanche* by the Consumers Gas Company; and we all know that Honorables have a nice perception of the style and manner in which one should live by the way. The Dinner Committee, from President Austin down to Manager Pearson, worked indefatigably, and had the satisfaction that springs from the knowledge that complete success had crowned their efforts. Many notables in the political and commercial life of Toronto, and the Dominion as well, graced the occasion with their presence. Of the *menu* and the speeches it need only be said that the one was perfect and the others were appropriate; and the entire proceedings were splendidly conducted by the Toastmaster—Dr. L. W. Smith, Vice-President of the Consumers Company.

The sight-seeing on the last day included many opportunities for pleasurable occupation—the weather clerk, however, might have been a trifle more accommodating—which were eagerly availed of. But, of course, the observed of all and the center of interest, was the magnificent new plant of the Consumers Company. As we intend, however, in the near future to devote a special article to a description of this massive and magnificent plant, we will now pass it over with the remark that Mr. Sherman knew whereof he spoke when he wrote that letter to the JOURNAL some weeks ago. We might say, nevertheless, that the retort house can truly be called an international construction, for in and about may be noted something like 11 millions pounds of American fire-clay goods. Stand and bridge-pipes of American manufacture fraternize with German mouthpieces, while English buckstaves and hydraulic mains manifest no antipathy to their surroundings. Again, American filling doors look down or over on German clinkering doors, while American coal is being carbonized on Canadian grates. Even the huge English gasholder permits itself to be calmly guarded by an American sentinel, in the shape of a Connelly governor.

All that remains to be said now is that the Toronto gathering was a most enjoyable reunion.

The Welcome Tendered to the American Gas Light Association by the Consumers Gas Company, of Toronto.

The Hon. James Austin, President of the Consumers Gas Company, delivered the following happy address of welcome to the members of the American Gas Light Association, on the occasion of the banquet tendered the Association by the Company:

Gentlemen—I have much pleasure in welcoming to this city, on behalf of the Consumers Gas Company of Toronto, as its President, the representatives of the American Gas Light Association, including within its membership both Americans and Canadians.

We esteem it an honor, I assure you, that you should on this occasion

have selected our city as the one in which to hold your sixteenth annual meeting, and to testify our appreciation of your choice we shall spare no efforts to make your visit enjoyable, and to enable you to carry away pleasant recollections of the "Queen City of the West."

We are proud to welcome you as members of an honorable vocation who, in the exercise of your duties, and by the employment of intelligence, skill, and scientific research, have conferred incalculable blessings on mankind.

We welcome you also as representative men; as men to whom has been entrusted the control of immense capital, and who, by wise and prudent administration of that trust, recognizing on one hand the claims of contributors and on the other the just rights of the public, have earned the commendation of all reasonable men.

It is by the existence of Associations such as the one you represent that the bond of relationship between the Dominion and the great neighboring Republic is most clearly defined.

While we recognize, and while the world at large recognizes the kinship of the two peoples, their common descent, their use of a common language, their close geographical situation, the similarity of their laws, customs, and manners; and while it is very true that all these tend very largely to establish friendly intercourse, still the vital bond of relationship between the two peoples is community of interest—and without this permanent and reliable ties are impossible.

This community of interest between the people of the United States and the people of Canada is so marked that, were it not for our tariff laws, we might be regarded as one nation, as we certainly are inheritors of the same blood, the same traditions, laws, and language.

Our meeting here, then—and I say this with a pleasure which I feel sure will find an echo in the breasts of all who hear me—is significant above everything of this fact, that, notwithstanding the contentions of our separate governments on this or that question, no matter how much diplomatic relations may be strained between the bodies politic, the people not only cannot be estranged, but their relations must become year by year closer and more cordial as their business interests become enlarged and solidfied.

I would not here speak for or against a commercial union or a closer political connection between the two peoples. These problems, however we may individually range ourselves as regards them, we must leave to be settled as time and occasion may direct; but I am confident their solution, whatever that solution may be, will be in harmony with the best interests of both peoples; and I am further confident that that solution will leave the friendship and good feeling at present existing between both peoples undiminished and unimpaired.

But quitting this subject, I would for a moment touch upon one which cannot, I feel sure, fail to excite pride and gratification in every gentleman before me—namely, the enormous growth and prosperity of both countries. Sixteen years ago, when this Association was organized, the most sanguine believer in the country's future greatness could not have anticipated this immense development which has, indeed, astonished the civilized world. Great cities have since been built, manufactures have been established, the mining and lumbering interests have been developed, the great plains of the West, which then lay waste, now supply with corn the markets of the world, lines of railway have been constructed to connect the Atlantic with the Pacific seaboard, and the land has been covered with a network of commerce.

In our own Dominion the progress has been perhaps more phenomenal. With our comparatively sparse population we have opened up our Northwest Territories, and established a trans-continental line of railway which competes with those of the Union. We have also founded large cities, and are rapidly forcing the world to recognize the illimitable possibilities of our Western country. And I might say—though not boastfully—that while in our Territories there are not perhaps the same facilities for making immense fortunes that exist in the Western States of the Union, they have such superior advantages of climate as to form a more desirable place for settlement.

However, whatever the comparative merits of the two countries may be, they are both inexhaustibly rich, and any rivalry which may exist must be a healthy one, and for the benefit of both peoples.

I know no better illustration of this material progress of the North American Continent than the history of your Association. There are those here, I doubt not, who were present at the inception of this organization, who have watched its advance with the birth of cities and the progress of the people, and who will bear out the truth of my remarks.

Again I welcome you; and I trust that such pleasurable recollections shall be the result of this gathering that it will never be forgotten by those present to-night.

[Second Paper.—*Concluded from page 259.*]

The Guide-Framing of Gasholders—Can it be Dispensed with, Wholly or in Part?

The Controversy carried on in the London Journal Reviewed.

By William Mooney, C.E.

The first fruit of the controversy which has extended to such length was Mr. Livesey's experiment; and this has been followed by Mr. Gadd's invention, a full description of which, by Mr. Newbigging, was read before the Manchester District Institution of Gas Engineers, Aug. 25.

Mr. Gadd's invention introduces an entirely new principle; the whole of the guide-framing being done away with, and the holder securely guided from the bottom curb. Briefly stated, the invention for dispensing with the usual guide-framing consists in placing the channel or other guides within the tank at an angle like the thread of a screw, instead of in the vertical plane. The guide rollers of the bottom curb, as they work in the channels or rails provided for them, give a helical or screw-like motion to the holder as it rises and descends in the tank. But as a description of this invention has been already given to the readers of the American Gas Light Journal (see issue of Sept. 17, p. 187; also Oct. 16, p. 225), no further description of it need be given here.

Notwithstanding Mr. Newbigging appears to accept Mr. Gadd's invention as the key to dispensing with guide framing, it seems to the writer that the conditions are much the same as in Mr. Webber's idea; that is, the whole structure must depend on the bottom curb and rollers for support, and the holder must be made stiff enough to withstand the force of the wind, however strong it may blow.

The point at which the holder would buckle or break in Mr. Webber's holder would be on the leeward side, at the point of contact with the upper roller or guide wheel (about 5 feet above the water line), and in Mr. Gadd's system this point would be just at the water line. With radial and tangential rollers well fitted to the tank guides, Mr. Webber's holder would be as firmly held at the bottom as Mr. Gadd's would be by his spiral system of guides. It is a question whether the added weight to the holder, necessary in any system dispensing with all or nearly all of the guide-framing, will not be as costly as the guide-framing it displaces, with the risk added.

Much stress is placed on the use of tangential rollers, in addition to the usual radial rollers; but, unless they have very wide channels to run in, there would be great danger of these breaking on the windward side of the holder when the holder was pushed against the opposite guides. The idea that holders can be adjusted so nicely that all the wheels shall fit tightly against the rails at all times smacks very strongly of what our English friends call "rot."

The tendency on our side of the water is to build holders of large diameter with from three to four lifts, but with an abundance of guide-framing.

The various writers whose opinions have been given in condensed form differ on the subject of the wind pressures to which holders are exposed. There can be no limit to the force which the wind may exert against any object—there being no reason why the greatest known or recorded pressures may not be surpassed in the future.

The writer has seen the path of a hurricane in the West where every house and tree had been swept away, and nothing in the shape of a gasholder could possibly have withstood such a force. But we know that gasholders do withstand very severe gales without damage. There must be some reason why gasholders are not blown away in high winds; and the following theory, not original with the writer, may account for it.

In this country it is well known that we have many square wooden structures on high foundations, without anchors or other means of security. If the wind had full play against the side of such a structure, it would seem impossible for it to withstand it. We know, however, that it is rare that such a thing happens, although thousands of buildings are exposed to the full force of the wind.

The theory is this: The air in the space inclosed in the triangle formed by the vertical side of the structure, the ground line, and the hypoteneuse connecting the extremities of these lines, forms an elastic air cushion which receives and yields to the force of the blast, transmitting but a small portion of the force to the structure.

As to the distribution of the force of the wind, and its effect on a gasholder, there seems to be also a difference of opinion; the point in dispute being whether the holder is pushed along horizontally, or whether the wind exerts an overturning force against it. If the pressure of the wind is equal over the whole exposed height of the holder, it will be pushed against the guides on the leeward side; whether it would not be

capsized if the guide-framing was out of the way is a problem which the experimenters will be apt to solve for themselves in the future. The tendency no doubt is to overturn the holder, as it is a top-heavy, floating, and, consequently, unstable body; and this is only prevented by either the rollers clutching the guide rails, or (in the future, when guide-framing has become obsolete) by the rigidity of the holder carrying the strains down to the tank.

In some respects a gasholder resembles an inflated balloon, which has to be held down, previous to its aerial flight, by numerous guys; a slight wind being sufficient to cause it to plunge and sway in an alarming manner.

In this connection it seems proper to call attention to the system of guide framing of gasholders invented by Joshua Horton, in 1851. Whether this system was ever tried is not known to the writer, but in view of what has already been done in the way of dispensing with lofty guide-framing, by Mr. Livesey, and the confidence with which he and other eminent English engineers express their belief in eventually changing completely the present system, a description of Mr. Horton's invention, and some proposed improvements upon it, are here given.

In a double-lift holder the guide-framing is carried up to one-quarter of the height of the upper section, and the guide wheels at top and bottom of lower section roll against the guide rail in the usual manner.

Securely fastened on top of the grip of the outer section is a column, extending half way up the side of inner section, the base of column being secured on the grip by a leg on the outside of outer section. According to the description of the patent, the column is a combination of wood and iron. The columns are tied together by a tee-iron at *C*.

Fig. 1 is a general view of the system, in which *A* is the guide rail on column, extending from the top of column (not shown in sketch) down to bottom of tank; *B*, guide column on grip of outer section, extending about half way up the side of inner section; *C* is the tee-iron connecting the tops of columns together; *D*, guide on inner section; *E*, tee-iron securing column on grip, and stiffening lower section; *F*, leg on inside of inner section.

Figs. 2 and 3 are side and front elevations showing the same system improved; Fig. 4 being a horizontal section of the lattice column on grip at its base. *A*, guide rail on column, extending from a point (top of column) one-quarter the height of inner section, down to bottom of tank; *B*, angles on outer section supporting base of lattice column on grip, and extending down outside of outer section; *C*, ties connecting columns together at top; *D*, lattice column on grip, extending about one-half way up the side of inner section; *E*, bottom curb; *F*, leg on inside of inner section; *G*, diagonal ties; *H*, guide rail on side of inner section, carried up above top, so that the rail is always in the groove of lower wheel.

The objection to this system is the added weight to the lower section; but this would be equally the case with any system dispensing with exterior guide-framing—particularly with Mr. Gadd's spiral system.

The grips and cups would perhaps have to

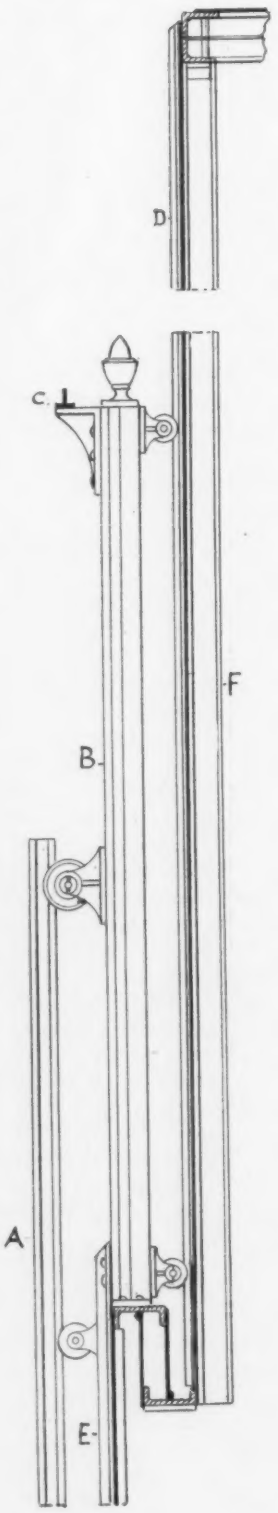
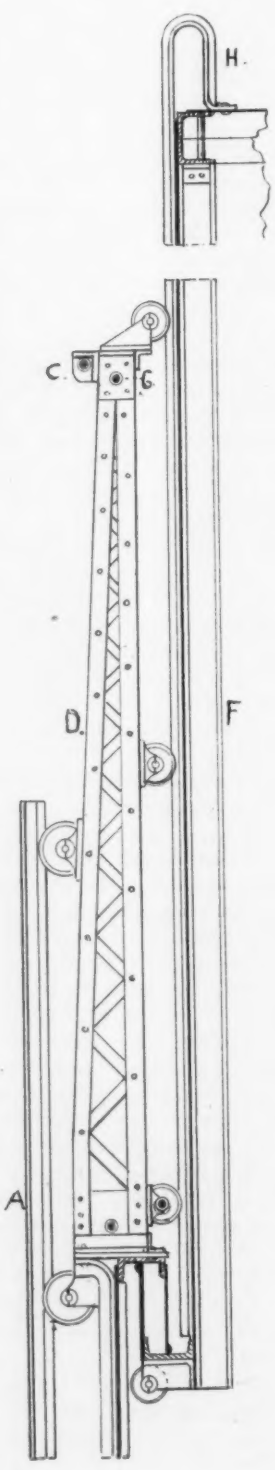


FIG. 1.



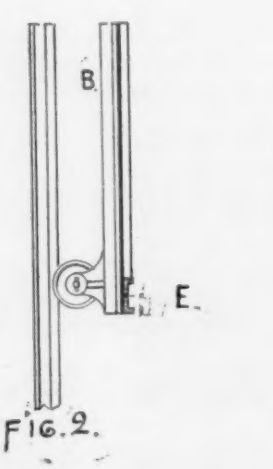


FIG. 2.

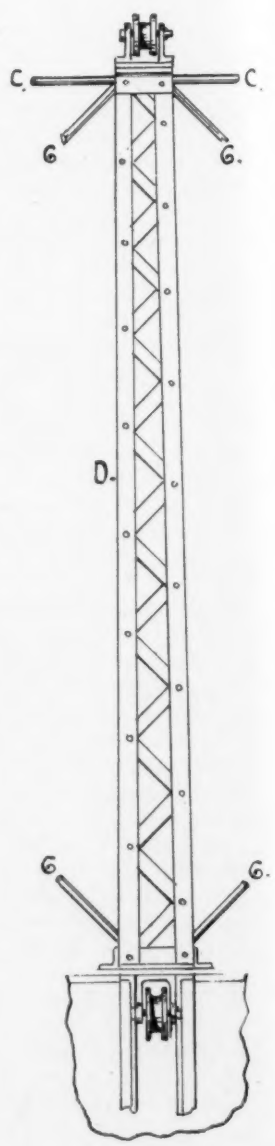


FIG. 3.

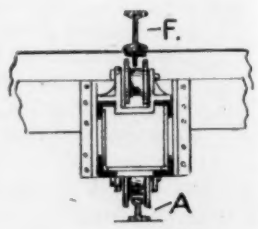


FIG. 4.

be made a trifle wider and heavier, to afford a better footing to the standard guiding the inner section.

It is no proof of the failure of Mr. Horton's system that no example of it exists now. Many good inventions have been condemned without a fair trial, and improvements now in common use have obtained recognition only after years of struggle and poverty on the part of the inventor.

This system would fulfill the stated requirements of most of the engineers engaged in the discussion before described. The strains in the upper section would be transmitted to the tank guides, and the inner section would always be sustained for one-half its height.

The standard on tank wall could be a very light lattice column, extending from top of tank wall to a point not far above the top of lower section, and carrying a guide rail extending from top of column to bottom of tank.

This system could be applied to a three-lift holder as well as any other, provided the lifts were of unequal heights, to admit of securing the column on the grip.

Holders to dispense with exterior guide-framing must no doubt be strengthened, particularly in the bottom curb. The sides could also be stiffened by diagonal or spiral bracing, consisting of light angle irons placed about 2 feet apart. These need not be carried over the vertical legs, but could be secured to them and to the sheets. These braces would prevent the blowing in of the sides of the holder, so often seen in high winds.

It is well known that a holder, with short lifts in proportion to its diameter, will bind or get jammed much easier than a holder having longer lifts. Different authors give different proportions for height and diameter, but it is generally agreed that the height should not be less than one quarter of the diameter. As the holder itself does not touch the guide-framing, except at the points of contact of the wheels and guides, it is evident that the further apart these points are the easier will the holder rise and fall.

The example of a drawer sliding into a desk will illustrate this. If the drawer is long and narrow, it slides in easily without binding; but let it be short and wide, it will stick, first on one side and then on the other.

Now, in view of this well-known fact, why will not a holder depending on single rollers at the bottom have a greater tendency to bind than one having two or more series of rollers? A three or four-lift holder towering, say, 100 feet or more in the air, unsupported anywhere except at the bottom, and that only on the outer edge, will be a grand sight to the engineer; but it will be a long time, and by many short steps, that this desired system will be attained.

That much may be done in the matter of dispensing with lofty guide-framing is not only possible but probable; but the question of how much or how little will not be solved for some time yet.

The first step—dispensing with the girders connecting the tops of the columns—no doubt can be easily and safely done; and as they are about 6 per cent. of the whole weight of iron in a double-lift holder, the saving will be felt at once. Beyond this it will be wisdom to go slow and by short steps.

When it is considered that the holder is the storehouse or reservoir from whence the consumers are supplied, and when the consequences of any failure in the supply are suggested and thought over, it looks as if there was no portion of the plant where experimenting would be more dangerous. Small companies, having but one holder, should certainly have that one guarded by every known means. The wrecking of that holder, or its partial destruction, would be disastrous in the extreme.

Just here it may be well to put in a plea for covered holders—this subject comes under the general title to this article—as holders inclosed in buildings need very little or no guiding; and if the guide framing can be dispensed with anywhere, here surely is the place. In our severe climate, with its blizzards and snow storms, covered holders are perhaps more of a necessity than in the milder climate of England. It may be argued against the use of inclosed holders that only smaller sizes can be economically covered; but very large ones have been inclosed on the Continent, and by using a dome-shaped roof it would seem that there is no limit, within reasonable bounds, to the size of a holder that might be covered.

The Providence (R. I.) Gas Company have several holders covered with domes—the largest covering a holder 136 feet in diameter.

Col. F. S. Benson, the well-known engineer of the Nassau Gas Company, of Brooklyn, N. Y., in a paper, read before the Society of Gas Lighting, in 1877, having for its title, "Covered Holders," gives the advantages of this system at length.

On the subject of economy of labor effected during the winter season, he says: "Those who are not blessed with a roof over their holders know full well the anxiety experienced when upon a winter's afternoon there arises in the east one of those banks of leaden clouds, the precursor of an old-fashioned snow storm. The anxious gas man wonders whether he had better send at once for help to be in readiness to shovel snow off the holder, when it does come, or wait till it makes its appearance, thus vacillating between fear and hope—fear that it will certainly snow, hope that it will turn into rain—does he pass the larger portion of a miserable night. When at last it really snows he begins to look about him for assistance.

"When he finds his night foreman does not know the residence of the men he wishes to employ, he is forced to go out into the highways and hedges and pick up night brawlers, half full of 'benzine,' to ascend the straight, narrow iron ladder in the face of a cutting gale. * * * Or if he should decide to take the chances he only finds his difficulties increased by a foot of snow, followed by a rain and freezing weather, rendering it necessary to use pick and shovel, if not hatchets, on the roof of his holder.

"How different the picture of the prudent manager who has foreseen this evil and prepared for it by erecting a house over his holders. He has no fears of snow storms or any other convulsion—short of an earthquake; and sees with a tranquil mind the rising clouds that portend a fall of snow."

No doubt, if the matter rested entirely with the engineer, whose anxieties and trials are little known to the powers above him, many more holders would be covered, and the engineer would have that portion of his troubles mitigated.

One of the writers on the subject under consideration mentions the absurdity of using architectural columns for the guide framing of gasholders.

In this he is right, as the use of a column, where no structure is to be supported upon it, is ridiculous, to say the least; but that is not all. The ancients who invented the orders of architecture established a certain proportion between the diameter of the column and the height—the height varying in the different orders as follows: Corinthian, height = 10 diameters; Ionic = 9; Tuscan = 7; and Doric = 8; and these proportions have proved to be the best. When we consider the height of a 3-lift holder, surrounded by a frame with Tuscan columns, with the height exceeding 50 diameters, we can see what disproportionate things they are.

In this city and its immediate vicinity may be seen examples of Gothic columns in clusters, three tiers high; single Tuscan and Corinthian columns, and various nondescripts, equally out of proportion, but all used for the guide-framing of gasholders.

The height of the absurd in this matter is reached in the framing of a holder at the Point Breeze station of the Philadelphia gas works. This is probably a relic of the early days of gas lighting in this country. It is illustrated and described in one of the early numbers of the AMERICAN GAS LIGHT JOURNAL.

The tank has a stone wall reaching 10 or 12 feet above the ground level, with enormous buttresses supporting the columns.

These columns consist of four cast iron standards to each, having a spread at the base of about 10 feet square, and tapering to the top, where there is a room, formed within the inclosure made by the four standards, having glazed windows on all sides and covered with a roof over all.

The object of these enormous columns, as well as the rooms at the top, is a question as obscure as the use of the pyramids of Egypt, and in fact is a question for the antiquaries to solve. The rooms might possibly have served for the temporary banishment of refractory stokers, in the same way that sailors are sent to the masthead for petty breaches of discipline.

The use of cast iron for columns or guides is fast becoming obsolete; and very properly, as many accidents have happened from its use. At the present time, when wrought iron can be obtained in every variety of shapes, there can be no excuse for the use of cast iron, except for caps, bases, rollers, etc.

The above notes, suggestions, criticisms, etc., have been written at odd times during a busy season, and this will account to some extent for their disjointed character. Any advice on the subject matter as given must be taken for what it is worth, and the writer will close with the advice of Pope:

"Be not the first by whom the new are tried,
Nor yet the last to lay the old aside,"

in the matter of dispensing with the guide framing of gasholders.

The Preservation of Gasholders from Rust.

A writer in the London *Journal*, in commenting on this subject, says that the attention of gas engineers has been much drawn by recent discussions to the fact that gasholders are unstable structures. They are also perishable erections, which is a further consideration that engineers cannot afford to lose sight of. Sooner or later the best constructed holder requires re-sheeting; and long before it arrives at this extremity it has demanded periodical attention and occasional patching. Time was when this tendency to decay was almost wholly confined to the holder itself; the guide-framing, being mostly of cast iron, was to all intents and purposes everlasting. Since guide-framing has been made chiefly of wrought iron and steel, however, this condition has been changed, and the care of the engineer for the preservation of his work has extended to the fixed as well as to the moving portions. The fact has been generally recognized, although the understood tendency of wrought iron and steel to rust, unless thoroughly protected by painting or otherwise, has not been allowed to stand in the way of their employment in these structures. The utmost regard that has been paid to this consideration is in respect of discouraging forms of construction which prevent periodical painting. It has been a particular rule with designers of gasholders, for which wrought iron or steel guide-framing has been chosen, that the pieces of the latter should never be so disposed that a paint brush could not be applied to every part. Notwithstanding all this care, however, the protection of the material of gasholders from rust is a serious trouble, and holders often cost large sums annually for scraping and painting, which nevertheless does not long preserve them from decay. At a time when the subject of gasholder construction is attracting general notice, it may be well to devote a little space to the discussion of this part of the question, which must always be important, whether external guide-framing is modified or abolished; for if the columns and stays are done away with the sheeting will remain, and this is the most perishable part of the work.

Gasholders wear out or decay sooner or later, as everybody knows; but it is not always easy to state the real causes of the observed effects. Old holders last a very long time in some places and under certain conditions; and, in fact, commonly fall to be removed rather because their room is required for the provision of larger storage than because of their own unfitness for work. On the other hand, quite new and apparently well-made holders may require extensive repairs and re-sheeting, although worked under precisely similar conditions. Some holders are racked almost in pieces by strains acting on the side and top sheeting, as is shown by distortions of their shape and incurable leaking. This may be due to bad design in the first place, the material being wrongly disposed; or, of course, leaking may be simply owing to bad workmanship in the erection and riveting. In some cases, however—and it is these we especially desire to discuss—the sheeting and guide-framing (particularly the former) rust out under the engineer's eyes; the progress of decay commencing with local blistering and pitting, and ending only with the ruin of the whole structure. What are the causes and cure of this deplorable decay?

In the first place, regard must be had to the quality of the materials used. Most engineers can recall instances of old holders that have never had much attention except an occasional tarring outside—the latter sometimes repeated until the semi-plastic coating hangs upon the iron in dirty creases, looking like the hide of a rhinoceros—and are yet, so far as the metal is concerned, in perfect preservation. Against these may be set the examples of new holders decaying as already mentioned. Here the quality of the iron becomes the first subject of inquiry. In all probability the iron in the old holders was of the finest brand procurable at the time, and cost perhaps £25 and upward per ton before any work was done to it. It is unnecessary to ask what the new iron may have cost. The old holder was made of sheets as fine in texture as copper, and as ductile and free from cinder. The modern article may be as scaly as a piece of slate; so that it contains all the elements necessary for rapidly disintegrating as soon as the skin is pierced and oxygen can get at the interior. We do not hesitate to delare that many modern holders are made of sheets of rubbish that can only be called iron by misplaced courtesy. Even when care is taken to specify a material possessing a certain tensile strength, and the requirement is insisted upon, the iron that satisfies the mechanical test may be utterly unfit for use in a structure intended to possess endurance rather than strength. A hard, dirty iron, coarsely laminated, may withstand a considerable pull along the grain when new; yet it will rot like paper as soon as the skin is broken and it is exposed to alternations of wet and dry in a sulphurous atmosphere. Competition in price is, of course, the origin of the practice of putting iron of this character upon the market. It is idle to blame the gasholder builder for all of the failing. He must cut down his tender in order to obtain work; and he is compelled to buy the cheapest material that will satisfy the specification. It is no concern of his how long the structure will last after he has received his last payment on the contract.

In point of fact, the treatment which the sheets of iron composing a gasholder receives is very severe. They are flattened and punched, and the seams are sometimes heavily strained in course of the riveting; then the metal is painted or tarred, and immersed in dirty water, from which it rises to be dried in air, or, as it may be, to be drenched by rain, day after day and year after year. If the paint dries hard, it cracks when the iron expands, and the water attacks the iron beneath. It is no wonder that under such treatment the poor laminated iron which the gasholder builder is driven to buy gives way, and blisters and gets into holes under its coverings. If gasholder sheeting is wanted to last any length of time, therefore, the first thing to insist upon is that the metal shall be of good quality—not merely strong in the mechanical sense, but pure also. There is no difficulty about this. Good iron is made now, as it always has been; and although there is no necessity for making gasholders of charcoal sheets, a reasonable degree of purity will always favor the life of the material when exposed to deteriorating influences. Gasholder sheets require to be fairly hard, to preserve rigidity of form; but the hardness need not mean scaliness. It is customary for the sheets to be specified to be oiled or painted at the maker's works before delivery. Anyone who has walked through a gasholder yard, and noticed the sort of stuff that is frequently so treated, may well entertain doubts respecting the utility of the process. Dirt and rust are not always carefully removed before the imaginary preservative is applied; whereas, to be effectual, this process requires even the removal of the scale. What is wanted, therefore, is a pickling process in weak acid, and subsequent brushing, before the plates and bars are oiled or coated. Without this it is better to let the iron rust and throw off the scale, if it will, before attempting to paint it. Half the mischief with iron is traceable to this one cause—scale. Even after having become pitted with rust, iron may be saved by drying and painting; but not if corrosion goes on untouched under a delusive hard coating of scale. Steel should always be cleaned from scale before painting; for, as it is much more easily corroded than iron, it needs more careful treatment from the first.

Supposing, now, that a gasholder has been well made, of good and tough materials, cleaned at the works, and coated with a skin of boiled oil before being dispatched for erection, what is the best thing to do with it after the erection is finished? We are not going to advertise anybody's paint or process. As for paint, practical men who have used much pigment upon ironwork know pretty well what to expect from it, and are not over-much impressed with all that is advanced by different makers in recommendation of their wares. A good deal has been published of late respecting the advantages of soapstone as the solid basis of paints intended for the preservation of ironwork; but experience of this compound with gasholders is wanting. The great desideratum with iron paints is that, while they should dry thoroughly in a comparatively short time, seeing that many holders must be painted while in use, they should not dry so much as to lose their nature, or become scaly or powdery with time. There is the main difficulty. Notwithstanding all that is advanced on behalf of the claims of some paints to special "anti-corrosive" qualities, we hold to the opinion that the value of a paint is a question entirely of its tenacity, adhesiveness, and the preservation of its body after drying. The "anti-corrosive" influence of the solid part of the constituents of a paint upon the material which it covers must be chiefly imaginary. If the paint will only *preserve itself*, and stick to the iron, it does all that paint can do. No matter what may be the chemical composition of a paint, the obligation to scrape it off if it blisters and leaves the iron is imperative; and the same may be said if it shows a tendency to crumble to powder. Hence it may be deduced that what French engineers call the "agglomerant" is after all the mainstay of any paint.

The cost and temporary character of painting for preserving ironwork have induced some engineers to fall back upon coal tar as a preservative for their gasholders. The most artificial preparation of tar for this purpose is the well-known "black varnish;" and excellent stuff it is when properly made and well laid on. It is all that can be desired for the inside of holders, its power of adhesion and preservation being perfect. Unfortunately, it shares with other preparations of tar the unpleasant tendency to turn a dirty sage-green when exposed to the air A remarkable instance of this once came under the writer's notice. The cast iron columns of a large new holder had just been finished with a coat of the varnish when there came a heavy thunderstorm, which burst right over the works with frequent lightning and sheets of rain, lasting perhaps an hour. When the rain ceased, the glossy black columns were seen to be

all turned this dirty light sage-green tint, which lay like a skin on the surface of the varnish, and the appearance of the work was spoiled. Tar simply boiled to expel the water, hardened by the addition of a little lime, and made drying with naphtha, is commonly used for gasholders, and is very good for its kind. It leaves a holder black, however, which is not an advantage for the summer; and so the surface is sometimes lightened by a wash of Portland cement mixed very thin with water and simply laid on with a whitewash brush. The different capacities of the iron, tar and cement for expansion with heat are apt to cause cracks, however, which require attention. Still, the preparation is a very useful one.

The subject of the preservation of gasholders from corrosion is, however, a matter that can only be fairly treated by the examination of recorded experiments and observations, and investigation of details which cannot be compressed into the space of an article. Many engineers possess data referring to the covering power and durability of paints and varnishes, upon which their practice in this regard is based. It would be interesting if some of this information could be collected and made generally available by means of a communication to one of the technical societies.

Kloenne's Gas Washer.

Amongst the letters patent issued this year we note a grant (No. 380,040) to M. August Kloenne, of Dortmund, Germany, which invention relates to an improvement in apparatus for washing and purifying gas. In the accompanying drawings Fig. 1 shows a vertical section of the apparatus, while Fig. 2 represents it in horizontal section.

Referring to the cuts, the letters *aa* represent a number of finely perforated plates, placed in the water spaces *B*, and having at their periphery the angle-irons *c*. Below each plate *a* is placed a bottom plate *b*, which slopes or inclines downwardly from the center, and fitted with a

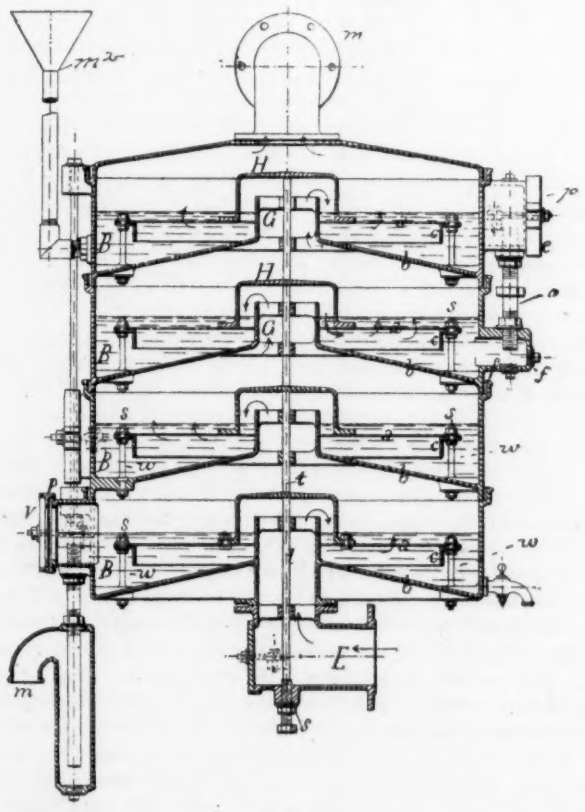


Fig. 1.

central mouth or opening *G*. Above each tube, *G*, is a cap, *H*, placed on the perforated plate *a*, and covering the tube *G*. A vertical rod, *t*, extends centrally through the tubes *G*, and is secured to each of the caps *H* by means of suitable cross bars *K*. This arrangement is more clearly brought out in Fig. 2. At its lower end the rod *t* is screw-threaded and carries a nut *s*. By loosening or tightening this nut the caps *H* may be raised or lowered, whence the plates *a* upon which such caps rest can be curved to any desired extent at the center. In this way the operator is enabled to get the same area between the plates *a* and the water near the point where the said plates are connected with the caps *H*, as between the water and those plates at or near the angle-iron *c*. Thus the gas, being under equal pressure below the entire area of the plates *a*, will pass through the perforations at similar velocities and in equal volumes. Following this out, the gas will come in contact with the same volume of water, driven around the angle-irons, and rinsing the entire area of the perforated plates *a*.

Bolts, *WW*, connect the plates *ab* near their circumference, as shown. When these bolts are drawn up or released the perforated plates *a* will

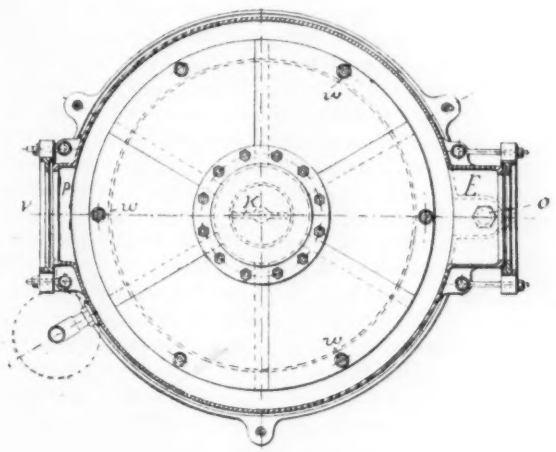


Fig. 2.

be raised or lowered at their circumference. The washing water, which is admitted through a funnel m^2 at the top of the apparatus, is conducted alternately from shelf to shelf, and is finally discharged through the pipe *m*. Its flow is, from the inlet and upper tier, to a chamber *p*, pipe *o*, and chamber *f*, into the second tier; thence, by similar chambers and pipe, to the next tier; and so on until the discharge is reached..

The tube *a* projects upward through the bottom of the upper chamber *p*, and is screwed into the bottoms of both the upper and lower chambers. By revolving the tube it may be raised or lowered as desired in the upper chamber, which allows of a ready adjustment of the depth of the water therein.

The regulating devices *p o f*, being adjusted on the outside of the apparatus, as shown, the water content may, therefore, be regulated while the washer is being operated. In order to permit ready observation of the height of the water content the chamber *p* may be provided with a glass window *v*.

The operation of the device is: The gas enters at *E* and passes through the lowermost tube *G*, under the cap *H*, hence (owing to the angle-iron *c*) a gas space will be formed under the lowermost plate *a*. From here the gas passes upward through the perforations of the plate *a*, and in its passage in a finely divided state through the water above the plate *a*, is perfectly freed from ammonia. Emerging from the first bath it rises from tier to tier, being finally discharged, in a purified state, through the exit pipe m^1.

The advantage in raising the bottom plate *b* at its center is, first, the heavier condensible products, such as heavy tar, etc., are deposited towards the circumference of the plates *a b*; and, secondly, to permit a smoother passage for the gas.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, Oct. 10, 1888.

Halifax Gas Affairs.—Gas Engineers' Salaries.—The Inventor of Gas Lighting.—Light Without Heat.—The Divining Rod.

A strange state of affairs has arisen at Halifax. The gas works in that town are the property of the Corporation, and for many years have been looked upon with favor, in gas circles, as being most efficiently managed by Mr. Wm. Carr, a gentleman of acknowledged standing in the profession. During the 12 years that Mr. Carr has held the reins the price of gas has been reduced from 96 cents down to 42 cents—less than half the original price—and this is sufficient to show that such an opinion is not without substantial foundation in fact. This apparently satisfactory condition of progress was disturbed, a few weeks since, by a ridiculously small matter—the appearance of an indefinite intimation in the columns of a London newspaper, to the effect that all was not square and above board in connection with the coal contracts at the Halifax gas works. This paragraph was copied and also made more pointed by a local paper. Inquiry proved that a certain gentleman was prepared to

make specific charges in support of these statements, but would not do so unless protected by the Corporation from all possible consequences and expenses that the law relative to libel might render him open to. While this inquiry was being held, however, the Councillors of Halifax felt that something must be done at once, and accordingly came to the remarkable conclusion that Mr. Carr must bring a libel action against the paper or resign his office. Mr. Carr, being advised that the action could not be supported in the absence of specific charges, preferred to take the latter alternative, and was immediately hustled out of office, his courteous offer to remain until a successor was appointed being bluntly refused. This was done before specific charges had been published. An agreement between the gentlemen above named and the Mayor of Halifax having been concluded, a sealed communication was opened and found to contain specific charges of malpractices against three persons—Mr. Carr, the Chairman of the Gas Committee, and a coal contractor. The second named at once repudiated the accusation in open Council in the plainest possible way. Such is the present state of affairs at Halifax, and further developments will be looked for with interest. At the present stage I prefer not to go beyond the mere statement of facts.

At a certain unimportant midland town the Gas Committee have got into disgrace for increasing salaries in their special department, without reporting the same to the Town Council. Whether they ought to have done this, or were quite within their power in acting as they did, I do not pretend to say; but would merely point out that the reporting to the Town Council would probably mean a public discussion on the subject; and a discussion of the pros and cons respecting a rise of salary, however important to the public interest, is certainly not agreeable to the feelings of the official concerned. According to our laws here any holder of an unused telegraph stamp (value 12 cents or so) can have his money back on applying at a particular office in London, and it really seems as if some Corporation members believe that a similar roundabout process should be followed by the gas engineer who feels himself justly entitled to an increase of salary, with the additional advantage(!) of having his good name held up to be pecked at by any spiteful, illiterate or uneducated person who may happen to be upon the Council. How is it possible that any outsider can accurately judge whether the increase is deserved or not? I have lately seen several published reports where the question of a gas manager's salary has been discussed at length in a manner that is nothing short of offensive. And while upon this subject I would propound a problem for the consideration of directors and members of gas committees. It is this: If it is dishonest for a gas manager to accept anything in the way of a gift from traders who supply him with commodities, is it honest to accept the services of the gas manager, as many do, in the designing and carrying out of extensions without the slightest recognition whatever? The cost of engineer's fees, often a considerable sum, is thus saved to the undertaking; and yet it frequently happens that the gas manager does not even get thanked for his trouble, lest such should be taken as an admission of the value of his extra services.

In the course of my holiday travels this year I found myself with a day to spare at Birmingham. Calling at the Windsor street gas works, I was courteously received by Mr. Chas. Hunt, the engineer in chief, and shown around. These works, which were entirely designed by Mr. Hunt and erected under his superintendence, are a fine type of modern gas engineering on the large scale, being capable, when fully developed, of manufacturing some 20 millions cubic feet of gas per day. As such I hope shortly to send a full description of them. Amongst other things I noticed that the whole of the retorts are drawn by means of Ross' machinery. One of these machines was at work, comfortably clearing out one retort in 25 seconds, and several times a pair of retorts were drawn under the minute, including bringing the machine into position at the mouthpiece. After this I visited the suburb of Handsworth, and inspected the very modest monument—a simple bust with inscription beneath—that is apparently considered a sufficient memorial of the memory of William Murdock, the inventor of gas lighting. Close in the vicinity is the Soho factory, where the employers of Murdock, Messrs. Boulton & Watt, carried out the practical development of the steam engine. To these gentlemen Murdock retained unswerving fidelity refusing all temptations to leave their service, and take up the honorable independent position that his abilities would readily have secured for him; and, indeed, he allowed the invention of gas lighting to lie dormant for many years, being meanwhile engaged in overcoming difficulties in connection with the construction, erection and practical working of steam engines. Perhaps this is why his memory has locally been lost sight of. It is said that the house he used to occupy is still standing, but the caretaker of the church did not know where it was. Both Mr. Bolton and Mr. Watt were buried at Handsworth. Opposite to the Murdock monument is one erected to the memory of Boulton, and a short distance from these is the Watt monument, a splendid life-size statue in alabaster, with handsome pedestal, by the celebrated sculptor Chantrey. It is considered to be one of the finest works executed by that eminent master. Murdock has been described as "tall and well proportioned in figure, with a most intelligent and benevolent expression of countenance." He reached the age of 83, and died in 1839.

Some investigations recently published by Prof. Oliver J. Lodge, on the subject of artificial light, are worthy the attentive consideration of all concerned in the supply of gas or of electric light. The Professor arrives at the conclusion that light is an electrical disturbance, and that light waves are excited by electrical oscillations, and goes on to remark that our present systems of generating artificial light are both wasteful and ineffective. The requirement is a certain range of oscillation, which may extend from 4,000 to 7,000 billions vibrations per second. Anything out of these limits is of no use, as it has no effect on the retina. Ordinary matter cannot be made to furnish such rapid vibrations by mechanical means. The strings used in musical instruments only give 1,000 vibrations per second, or less. So it is necessary to fall back on atoms, and the most convenient way of getting vibrations of the necessary rapidity is the application of heat. But the vibrations thus obtained are infinite in number and mode, and only a very small proportion out of the whole come within the range above named. There is no known method of separating out the useful vibrations from the great majority, and hence it is that light cannot be produced without heat. In the case of ordinary combustion only a small percentage of the energy evolved is obtained in the form of light; and with the electric light, the energy for which first originates in the combustion of the fuel under the boiler, it necessarily follows that but a small proportion of the original energy can be realized in the form of light in the lamps. If we expose a carbon filament or a piece of quicklime to heat, as the temperature rises higher and higher, rates of vibration of the atoms are obtained until at last such rates as the retina is constructed to perceive are reached. But the low rates are not transmuted into the higher; there is simply a superposing of a comparatively small number of vibrations coming within the range above named upon the lower ones. A small range of rapid vibrations is required, and we know of no better plan than to make the whole series leading up to them, as though in order to get the sound of some one shrill note upon an organ we were obliged to depress every key and every pedal. What is wanted is how to produce the shrill note by itself, and Prof. Lodge holds out the production of light waves without any others as the problem of the future. These considerations render it evident that there is a large ground to be worked in the way of increasing the proportion of light rays in the total energy produced by any artificial sources of light.

At the recent meeting of the North of Ireland Gas Manager's Association the members were treated to a diversion of a somewhat unusual and mysterious kind. Mr. John Stears, of Lisburn, illustrated his remarkable powers as a finder of water springs, underground drains and cast iron main pipes simply by walking over the ground. He carried a forked hazel twig in his hands, and on reaching a spot over one of the above named the twig bent or jerked in a peculiar manner, quite independently of the holder, and Mr. Stears was able to name correctly, in each case, the nature of the disturbing cause. The visitors tried every possible test, and the most incredulous were forced to admit that there was no deception, and that the finding of the water, etc., by this means was an undoubted fact. The subject has since been discussed in the *Journal of Gas Lighting* at some length, a considerable amount of evidence in favor of the divining rod being produced. Anyone who has investigated the mysteries of animal magnetism and the remarkable phenomena which undoubtedly underlie the operations known as mesmerism, clairvoyance and spiritualism, will readily admit the possibility of certain persons being gifted with such a peculiar arrangement of the nervous system as will render them sensitive to the influences, electrical or otherwise, of currents of water, or lines of iron tubing, even through several feet of intervening soil. Whatever the cause there is no disputing facts. A party of gas managers are not likely to be bamboozled by anything in the way of a conjuring trick. Instances of successful water finding by means of the forked hazel twig have repeatedly come within my own knowledge. It is entirely a gift, due to constitutional peculiarities, and therefore cannot be acquired by study or practice, and is, with very few exceptions, confined to the finding of water. There are times with every gas manager when the possession of such a faculty as that shown by Mr. Stears would be of immense value.

THE capital stock of the Fremont (Neb.) Gas and Electric Light Company has been increased to $50,000.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

DURING the last term of the Circuit Court—held at Concord, N. H.—one of the cases tried was that of the United Gas Improvement Company against the Manchester (N. H.) Gas Light Company. The complainants claimed that defendant had authorized them to design and construct a gas plant at Manchester; that said plant had been perfected; and that the defendant had refused either to receive or pay for it. Defendant's reply was that no contract of the nature under dispute had been entered into. The issue was tried before Judge Colt and a jury. No verdict was reached, although it is asserted that of the faithful twelve nine favored the plaintiffs. The case was ordered continued on the docket, which means that another rehearsal of the merits must be postponed until the next term, to be held in Portsmouth, May, 1889. In the meantime perhaps arbitration shall remove the necessity for further legal proceedings.

IT is understood that the consolidation of the Hudson (N. Y.) Gas and Electric Light Companies has been amicably accomplished. The Consolidated Company proposes to erect a suitable station for its electric lighting annex on property adjoining the gas works, and close to the river front. The Diamond street property, formerly devoted to the housing of the electric plant, is to be sold.

THE Vallejo (Cal.) Gas Company, having accumulated quite a stock (something like 3 tons) of old copper, concluded to turn the same into cash. The San Francisco market price not being sufficiently attractive, the careful owners made inquiries in the Eastern section with the result that the lot was shipped to parties in Buffalo, N. Y.

IN a legal contest between the Ohio (natural) Gas Company and certain of its patrons, Judge White, of Pittsburgh, Pa., has decided that gas companies must adjust their rates at figures which, in the eyes of the law, are—to use the jurist's own words—"fair and reasonable." A sort of "protection" to the consumer, but quite the contrary to the producer.

The Milwaukee (Wis.) *Sentinel* says that the proprietors of the Menasha (Wis.) electric light plant have offered the same for sale to the city authorities, the consideration asked being $10,000. The offer was declined. The *Sentinel* also says that Menasha will probably return to the use of gas for public lighting purposes.

THE net rate of $1.25 per thousand cubic feet ($1.35 gross, with 10 cents off for prompt payment) which took effect in Wilmington (Del.) on the 1st of October, was well received by the residents. The increase in sendout thus far is most gratifying. Treasurer Taylor and Supt. Curley, however, are not greatly surprised at the result.

AT the annual meeting of the Woburn (Mass.) Gas Light Company the following officers were chosen: Directors, Benjamin Hinckley, Jno. Johnson, G. R. Gage, R. J. Monks and C. A. Jones. President, B. Hinckley; Clerk and Treasurer, R. J. Monks. The by-laws were altered to conform to the law of Massachusetts requiring the fiscal year of gas companies in that State to terminate with the last day of June.

AT the annual meeting of the Milford (Mass.) Gas Light Company, which was presided over by Mr. J. B. Bancroft, the reading of the annual reports gave great satisfaction to those interested. The Company enjoyed an extremely prosperous season, and the outlook promises even greater advance than that made in the last twelvemonth. The election resulted in the following choices: Directors, A. and C. F. Claflin, B. E. Harris, N. B. Johnson, E. L. Wires, J. B. Bancroft, F. L. Dutcher, J. N. Davis, and L. H. Cook; President, C. F. Claflin; Treasurer, B. E. Harris; Secretary, L. H. Cook.

ON the evening of October 13th Jas. Haslip, a lineman in the employ of the Brush Electric Light Company, of Raltimore, Md., was fatally shocked by the electric current while engaged in making some needed repairs to a lamp on Lexington street.

THE proprietors of the Marblehead (Mass.) Gas Light Company have just completed the extension of the Company's mains to the adjoining hamlet of Devereux.

THE plans for the extension—virtual renewal, in fact—of the plant of the New Albany (Ind.) Gas Light and Coke Company have been completed. The new works, which are to be model ones in every respect, will require an expenditure of upwards of $30,000.

SOME time ago we noted the organization of a gas company for the purpose of supplying gas and electric light in Ishpeming, Mich., and in connection therewith we recently received the following from a correspondent: "That the Neenah (Wis.) firm—Messrs. Higgins, Bros. & Co.—now engaged in constructing a gas works at Ishpeming mean business is very evident. Although work was not begun until Monday, Oct. 9th—in fact a site was only procured some three days before that date—pipe has been laid in several thousand feet of trench work, and the masonry on the main buildings is well along. The latter, intended to house the gas and electric light apparatus, are to be 34 feet wide by 60 feet in length, and are to be of the most substantial sort. The work is being prosecuted as fast as 150 well-trained pairs of hands can execute it. The contractors are satisfied that the 10,000 residents of Ishpeming can and will support an artificial lighting company, hence the plant and apparatus are not to be of a temporary nature, nor on a skimpy scale. No; Ishpeming wants both gas and electric light, and the Messrs. Higgins are evidently disposed to see that that want shall be catered to in a way at once satisfactory and thorough."

THE new plant installed in the works of the Goshen (Ind.) Gas Light Company by Mr. Henry Pratt, of Chicago, meets the complete approval of the proprietors of the Company. The new gas was turned on to the city on the evening of Oct. 8, and the consumers freely expressed their belief in its merit as an illuminator.

A WORCESTER (Mass.) correspondent says that Mr. Rollins' condition gives great encouragement to his friends, and adds that there is every promise that he will soon be at himself again—very cheering news, indeed.

FROM the Quarterly Report of the Superintendent of Lights, Providence, R. I., we learn that the expenditures for the quarter were $34,546.76, partially distributed as follows: Payments for gas, $13,122.15; electric lights, $10,639.21; lamplighters, $7,544.51; gasoline lamps, $1,568.07. Amount of appropriation for the fiscal year ended Sept. 30, $146,000; expended during the year, $142,177.81—leaving a balance of $3,822.19.

OWING to the high price at which anthracite coal is sold in certain rather thickly populated districts of the West, many have resorted to the practice of using equal parts of bituminous coal and gas coke as a fuel for ordinary domestic purposes. The mixture is said to give good results, both as to heat evolved and economy.

THE authorities of Jersey City, N. J., recently received the following proposals for lighting the city during the ensuing year: United Gas Improvement Company, 1 325 lamps, in the Bergen and Hudson City districts, at $19.25 each, with a reduction of 2 per cent. on lamps reported unlighted a certain number of nights in the year. Similar figures were presented for 125 lamps in the Greenville district. For 950 lamps in Jersey City proper the bid was $18. In case the bids are accepted (which is certain to be the fact), the city is obliged to set aside the sum of $600 per annum (to be paid over monthly), to reimburse the Company for "extraordinary breakage" of lamp glasses—which speaks volumes for the Jersey City street gamin's handiness with stones and other missiles. The Jersey City Electric Light Company presented two bids—first, 40 cents per night per light if only 40 arcs are authorized; second, 33 cents per night each in case 83 arcs are demanded. These lights are to be maintained every night in the year. The N. Y. and N. J. Globe Gas Light Company offered to maintain 1,000 or 1,500 oil (naphtha) lamps, to be paid for at the rate of $1.68¾ per lamp per month, an advance of 6¼ cents over the rate charged last year. The oil men, in defending or explaining the increase, contend that they are obliged to take this course because of the advance in the price of oil, etc. The bids are being considered in Committee, but the rates given are undoubtedly those that shall prevail in 1889.

THE Home Gas Machine Company has been organized in Portland, Me., with a capital of $500,000. The incorporators are Messrs. Edwin S. Thayer, Sharon, Mass., and Ellery R. Merriam and Geo. Hunt, Boston, Mass. E. R. Merriam is President, and Edwin S. Thayer is Treasurer. The Company proposes to manufacture gas machines, burners, cooking stoves, fixtures, and other appliances pertaining to heat and light, with the right to acquire and dispose of patents, licenses, leases," etc. Judging from the amount of capital reported, and the peculiar wording of the Company's articles of incorporation as well, it is possible that its promoters may in time imagine they have a legal right to engage in the manufacture and distribution of gas in certain "eligible localities."

SINCE the purchase by the Danbury and Bethel (Conn.) Gas Light Company of the franchise and plant of the local electric light company

President Merrit and his associates have, after a thorough investigation of the conditions, reached the conclusion that it was little wonder the electricians were unsuccessful in earning a profit on their business. The competition with gas was carried on so recklessly that rates were at a ridiculously, if not ruinously, low figure, hence they were glad to extricate themselves by eventually turning over the supply to the gas men. The latter, however, believing that free trade in electricity, while possibly a good thing for the consumer, was not equally beneficial to the producer, on obtaining possession published the following schedule, the same being equivalent to something like a 10 per cent. advance on the one in vogue when the electricians were engaged in their attempt to shut up the Danbury Gas Company—even now the Danbury rate is about equal to that which prevails in the larger Connecticut cities, such as New Haven, Waterbury, Meriden, etc.: "Office of Danbury and Bethel Gas and Electric Light Company.—On and after Nov. 1st, 1888, prices for electric lights will be as follows:

	To 10 P M.	To 11:30 P.M.
June	$8.30	$9.70
July	8.80	10.20
August	8.00	10.30
September	9.40	10.80
October	10.50	11.90
November	11.50	12.90
December	12.40	13.80
January	11.50	12.90
February	10.60	12.00
March	10.00	11.40
April	8.80	10.20
May	9:30	10.70

"Above is for 6 nights per week; one-sixth will be added if lights are used Sunday. A discount of 5 per cent. for cash will be made, if bills are paid at the office of the Company by the 15th of the following month; and an additional discount of 5 per cent. will be made to those signing a yearly contract. An additional 5 per cent. allowed on more than one light. For the installation of lights a charge of from $5 to $10 will be made, according to the work done." These prices refer to commercial lights, which are of the divided type—that is, 1,100-candle power nominal; the streets are illuminated by 2,000 c. p. arcs; but we are not aware of the price paid by the city therefor. The capacity of the Company's electric annex equals 132 commercial and 75 street lights; but at the present time it is supplying current to only 65 of the first, and to 54 of the latter class. In the meantime the Danburyites seem to have lost sight of the fact that the price of gas (to which no increase has been made since the amalgamation of the former varying interests) during the struggle for supremacy was brought down to an average rate of $1.62 per thousand cubic feet; a very fair, not to say low, figure. Take it all-in-all, we think they have slight reason for complaint at the Company's action, and President Merritt is to be congratulated on the tact which he has displayed in arranging a schedule that ought to call out nothing but satisfaction. It is not the first time, however, that his good qualification for business has been practically illustrated.

We venture the prediction that Secretary Vansant, of Messrs. Morris, Tasker & Co., is to become a great favorite with the gas men.

Elsewhere we note how the charm of cheaper gas is working at Wilmington, Del., and in connection with or in continuation of the subject we herewith append a report of gas rates which ruled in that city since the formation of the Company in 1851. We are indebted to Superintendent Curley for our knowledge of the figures:

Date of Reduction.	Net Rate.
September, 1851—time of starting	$3.32½
February, 1853	3.00
July, 1868	3.00
" 1872	2.70
January, 1876	2.50
" 1879	2.00
April, 1881	1.80
January, 1882	1.50
" 1887	1.35
October, 1888	1.25

In 1864, on two different occasions, an increase was made; the first being ordered in July, when 25 cents per thousand was added, and again (in October) when the figure was placed at $3.50. Of course, the commercial overturning attributable to the war of the rebellion is responsible for this break in the otherwise all-one way record of the Wilmington Company.

The work of installing the electric lighting plant recently contracted for by the Steubenville (O.) Gas Company is about completed.

Burlington (Vt.) is agitated over the prospect of a gas war, which, if it is ever fought, can only result in disaster to the citizen who is now decidedly anxious for the sound of the first gun. At any rate, a Citizens Light and Power Company has been organized in the city, and it is officered as follows: President, Willard Crane; Vice President, Elias Lyman; Clerk and Treasurer, Robt. Roberts. The organizers cannot hope to accomplish much in the way of actual construction for some months.

Some time ago we noted that the Council of Pawtucket (R. I.) had agreed to the scheme reported on by certain investigators which favored the establishment and operation by the city of an electric lighting plant for street illumination, and presumed that this action settled the matter. It appears, however, that the Mayor vetoed the resolutions and ordinance, but the exponents of municipal engineering and wire pulling returned to the charge, and successfully, by passing the ordinance over the veto. The Pawtucket Gas Company, which now performs the public arc lighting, offered to substitute 1,200 candle power lamps for the 2,000 candle variety now supplied, agreeing to charge therefor (on a schedule calling for hours of burning to be between dusk and one A.M. $90 per year. The Council Committee it appears ransacked New England for a locality that obtained a like service for a lesser sum, and finally succeeded in ferretting out a spot which met their necessities. They did not say, however, that the Company in the aforesaid "spot" was playing a pretty desperate game at competition rates in the attempt to induce the home gas men to assume its plant and contracts at a fair sum for cash. The name of the "spot" is withheld for good and sufficient reasons. We believe that the Pawtucket authorities have given a sort of pledge that the municipality shall not engage in commercial lighting; but what is there that holds in a Councilmanic pledge?

The Pittsburg (Pa.) *Dispatch* says that the Directors of the Standard Gas Light Company of this city, have made a proposition to Mr. H. M. Bennett (President of the Pittsburg Consolidated Gas Light Company) to accept the General Managership of the Standard Company's business. Mr. Bennett is beyond doubt a most capable and efficient man, and whose connection with the Consolidated Company has been of great value to that enterprise. Perhaps the proprietors of the Company will not let him come to New York, and now while we think of it, why should the Standard folks be obliged to go outside of their present staff for a business manager? Can Mr. Bottsford have severed his connection with the Company? If not, the accepted rules of civil service reform, which are perfectly familiar to Mr. Bottsford, from his former service on the New York *Daily Tribune*, are seemingly in danger of repudiation at the hands of those in control of a Company, which, at the time of its birth—and for a few moons thereafter—confidently proclaimed its intention of revolutionizing the method and manner of supplying gas in the metropolis. It was a precocious child—in fact its aptitude for speech at the very moment of birth proved its precocity; but somehow or another the bib and tucker yet seem appropriate garments for it.

The season's entire output of coal from the South Prairie mine (Wash. Ter.) is said to have been contracted for by the San Francisco Gas Light Company. This mine, which was opened in 1881, is on the Northern Pacific Road at a point 28 miles from Tacoma. The coal bed is 4 feet thick, and the dip is from 45° to 80°. In 1885 it produced 40,161 short tons.

The Tonawanda Gas Light Company has instituted the plan of furnishing its consumers with a card, one side of which carries a perfectly plain explanation of how a meter should be read—the dials are illustrated, and the method in which the hands travel over their ground is carefully pointed out. In fact, the Tonawanda man or woman who, from a study of the card, cannot understandingly "take a meter" ought to be told when the rain is falling—so the dampness will not affect his or her clothing. On the reverse side of the card is printed the regular order of the months—one card will last for three years—with a tabulation so indexed and arranged that, if the figures have been jotted down, the consumer can tell at a glance what quantity of gas was consumed, together with what was paid for it, and the state of the meter at the end of each month.

Mr. Enfield, of the Dallas City (Texas) Gas Light Company, is again to the fore in the matter of cheap gas, he having been authorized by the

proprietors of the Company, something over a fortnight ago, to make the following announcement: "Having increased our gas plant and introduced many improvements for cheapening production, together with the expectation of cheaper coal in the near future, we will reduce the price of gas to $1.90 cents per thousand cubic feet, on Nov. 1, for all gas consumed after that date. This brings the price of gas within the reach of all, for light and heat." Mr. Enfield's consumers ought to feel satisfied over this move, and his brother managers will quite likely agree with him in the idea that the new rate is a cheap one; and will possibly have that conviction strengthened by the remark that Pittsburgh coal—the sort carbonized at Dallas—costs $7.65 per ton (2,000 lbs.) in his vicinity. The Company has offered to perform the public lighting for the sum of $20 per lamp per year, a moon-table to be followed.

THE Comptroller of Buffalo, N. Y., has notified the Committee on Lamps (to whom the proposals have been referred) that he had received from the three local electric light companies bids for electric lighting for the ensuing year, based on a rate of 45 cents per light per night—a reduction of 2½ cents per lamp on last year's prices. The gas companies also agreed to make a reduction of 5 cents per thousand on the present rate ($1.35) for gas supplied to the public buildings.

MR. JAMES M. CLARK, presumably representing certain capitalists identified with the Standard Oil Company, has applied to the Council of Detroit for a franchise for the distribution of natural gas in that city. The application was referred to the Committee on Streets and ordinances, and they have been figuring with Mr. Clark on the necessary provisos. As near as we can make it out the Committee will report an ordinance without specifying therein what price may be charged, and without limiting the life of the ordinance, the adjustment of which terms will undoubtedly furnish amusement for the Council when the instrument comes before them. The real object of Mr. Clark's backers, however, is shown in a clause which grants them the right to make and supply artificial gas, "should the supply of natural gas fail." The correspondent who kindly forwarded us these particulars, adds that, "During Mr. Clark's preliminary struggles with the Committee he objected to a proposed section requiring the Company to put down pipes wherever gas was wanted; to too close supervision of the work of pipe laying by the Board of Public Works, and to Ald. Kellogg's suggestion that pipes ought to be laid when one-half of the residents on a street wanted gas, Mr. Clark arguing that there might be only a few houses on some streets. He evaded Alderman Regan's query as to how many consumers per mile of main would enable the Company to transact a profitable business. He said that the price of hard fuel would always fix the gas rate; that about 12,000 feet of natural gas would equal a ton of bituminous coal, and from 18,000 to 20,000 would displace a ton of anthracite. He did not suppose the Company would charge more than 20 cents per thousand for gas; but would not guarantee that. He said that natural gas was introduced by the Buffalo (N.Y.) suppliers at an initial charge of 60 cents, but this had been cut down to 20 cents. Two pipes would be laid in Detroit—a large and small one—the latter to be used in case of accident to the former. Contracts with consumers would be made by the year, because meters were unreliable for natural gas. These were the leading features of Mr. Clark's argument, but in my opinion the entire scheme is based on an endeavor to secure an opening for an artificial gas company in Detroit. You may be sure that the ordinance will be vigorously fought in Council, and I think I am safe in saying that Detroit's citizens are indisposed to favor any invasion of the rights enjoyed by those in charge of the present artificial gas supply of the city. With that understanding I expect to witness the ordinance divested of the section granting the right to manufacture gas in case of a failure of the supply of the natural article. —DETROIT."

RESIDENTS in the Roxbury district of Boston are complaining of the poor quality of the gas supplied them, yet the Inspector's returns show the article to have an illuminating power of about 19 candles. There is, however, quite a variation in it from day to day—say, 18.75 candles today, whereas to-morrow it may show 19.50, or even higher, and this unevenness may account in great part for the dissatisfaction. The main system, also, is more than likely inadequate to the requirements of the district.

PEOPLE whose course brought them in the vicinity of Washington and Boylston streets, Boston, at a late hour of the 18th ult., were either astonished or alarmed—probably both sensations were experienced—at the rapid and sinuous elevation or projection into the air of a manhole cover that had been placidly reposing over a portion of the Edison Company's subway. The cover's rise was followed by a flash of flame, a sharp report and a thick column of water. This Pompeian experience is susceptible of the following explanation. Sewer gas collected in the manhole, and a convenient spark from one of the wires exploded the vapor. Surface drainage accounts for the "watery portion" of the spectacle.

PRESIDENT FETTE, who is as firm a believer in the stability of the gas business as ever, has authorized Superintendent C. R. Dinsmore to inform the Danverites that from and after the first inst. the local gas rate is to rule at $3 gross, with a discount of 20 cents per thousand cubic feet, on all bills showing a monthly consumption of 300 cubic feet and over, for prompt payment. This is a very much better rate than would seem from a first glance at the figures; in fact the concession is a large one. In 1886–7 the Danvers Company's total sendout was just short of one million cubic feet, and the average price received therefor was $3.27 per 1,000. Mr. Fette is on record as having said that the different companies under his control, or amenable to his influence, shall supply gas at the lowest figure possible—circumstance of manufacture alone being the determining factor; and he has kept that pledge, too. It might be said that the total number of meters in use in Danvers (1886–7) was 87, of which 43 are 3-light.

RIGHT on the heels of the above comes another announcement of a reduction made by a Massachusetts Gas Company (the Dedham and Hyde Park) of which Mr. Fette acts as Manager. In the Hyde Park instance the rate to ordinary consumers has been reduced to $2.50 per 1,000; large users, as well as those who employ gas for domestic or mechanical purposes being granted a special price. The new schedule took effect yesterday. To be precise in the matter of naming the Company we should have said the Dedham and Hyde Park Gas and Electric Light Company—for there is something in a name. In connection with the Dedham Company's action, a friend of the latter, in commenting thereon, wrote the following apt paraphrase:

"Let those burn gas who never burned before,
And those who burned, burn all the more."

SOME time ago we noted that the Louisville Gas Light Company had arranged for the construction of a holder in the southern section of the city, and that the contracts connected with the undertaking had been awarded. This holder, which is to be a triple-lift, 145 ft. diameter by about 36 ft. in section, is intended to be a duplicate of the one erected two years or so ago by R. D. Wood & Co., of Philadelphia, to the order of the Chicago Gas Light and Coke Company, and will greatly add to the effectiveness of the Louisville Company's position as a gas supplier. The contract for the tank excavation had been let to Wm. F. Shanks (we give publicity to this so that, if Mr. Shanks visits other gas men in search of tank a contract, they may know how he acted in Kentucky's big city), who started off well enough, but caved in when he found that his estimate was very wide of the mark—in fact, he could not be prevailed on to proceed with his contract even when most liberal terms were offered by the Company. Engineer Barret, not to be "stumped." studded the excavation with arc lights, and is now working night and day with all his accustomed energy; all of which means that that tank will be finished, even if a branch of the Ohio river is discovered in the locality.

IN the course of a very concise and courteous letter from Treasurer Harding, of the Bridgeton (N. J.) Gas Light Company, the following is gleaned: "It is with deep regret that I inform you of the deaths of two of our Directors. Benjamin Keen, our late President, died last August; he was in his 73d year. Mr. Keen had been President since the death of the late R. C. Nichols, in 1883. On the 20th ult. occurred the death of Secretary C. E. Elmer, whose demise took away the remaining original Director; the Company was organized in 1857. We recognize in the death of Mr. Elmer a great loss, not only to the Company, but also to his many personal friends. I came here 15 years ago, comparatively a stranger and unacquainted with the business; but he (and others, too) soon made things smooth and pleasant for me. Only one Director of those who were then serving now has a place on the Board. Mr. Elmer's place has not yet been filled. With the exception of Mr. Jonathan Elmer—now our President—the Board consists of comparatively young men. A word about our business may not be out of place at this time. Our consumption is increasing quite rapidly from year to year, so much so in fact that we shall be compelled to increase our manufacturing plant next season. In some sections of the city, our consumption having outgrown our street mains, our Directors instructed me to lay an additional main from the center of the city to one of the outer districts, which will take some of my spare time (if there be any such) for the next two weeks. We have electric light here, but it does not seem to hurt our business. The streets are lighted by arc lights, and some of the stores have a few incandescent lamps. There never has been any friction between our Company and the electric light company. We keep our price pretty low for a small place—to ordinary consumers, $1.50 net, and as low as $1.30 to the large manufacturing interests. We make gas exclusively from coal. Our stock is all owned by investors who live in the town, which is a great advantage." For others of Supt. Harding's kindly-expressed words we return our thanks, and shall certainly make early avail of his offer. We have had occasion in our item columns to mention the true progressive spirit manifested by those in charge of Bridgeton's gas plant, and there can be no doubt that those in charge of the Company's interests—even if comparatively young men—are in every respect competent to uphold them.

[Official Report.—Revised by the Secretary.]

Sixteenth Annual Meeting of the American Gas Light Association.

Held at Temperance Hall, Toronto, Canada, Oct. 17, 18 and 19, 1888.

First Day—Morning Session.—Oct. 17.

Routine Business.

The following members were in attendance:

Adams, H. C., Phila., Pa.
Atwood, H. A., Plymouth, Mass.
Bates, J. W., Hoboken, N. J.
Baxter, Robert, Halifax, N. S.
Benson, F. S., Brooklyn, N. Y.
Blodget, C. W., Brooklyn, N. Y.
Borgner, C., Phila., Pa.
Bredel, F., New York City.
Capelle, G. S., Wilmington, Del.
Clark, W., Phila., Pa.
Cartwright, W., Oswego, N. Y.
Cartwright, M., Rochester, N. Y.
Coffin, J. A., Gloucester, Mass
Collins, A. P., New Britain, Conn.
Cole, T. W., Altoona, Pa.
Coggshall, H. F., Fitchburg, Mass.
Connelly, J. S., New York City.
Connelly, T. E., New York City.
Corbett, C. H., New York City.
Cornell, T. C., Yonkers, N. Y.
Cowing, J. H., Buffalo, N. Y.
Cressler, A. D., Fort Wayne, Ind.
Cushing, O. E., Lowell, Mass.
Daly, D. R., Jersey City, N. J.
Davis, F. J., Waltham, Mass.
Dell, J., St. Louis, Mo.
Denniston, W. H., Pittsburgh, Pa.
Diall, M. N., Terre Haute, Ind.
Dickey, C. H., Baltimore, Md.
Dickey, R. R., Dayton, O.
Down, W. H., New York City.
Findlay, J. H., Ogdensburg, N. Y.
Flemming, D. D., Jersey City, N.J.
Floyd, F. W., New York City.
Fodell, W. P., Phila., Pa.
Gates, F. W., Hamilton, Ont.
Geggie, D. H., Quebec, Canada.
Goodwin, W. W., Phila., Pa.
Graeff, G. W. Jr., Phila., Pa.
Green, J., St. Louis, Mo.
Gribbel, John, New York City.
Griffin, J. J., Phila., Pa.
Harbison, J. P., Hartford. Conn.
Hanford, L. C., Norwalk, Conn.
Hookey, G. S., Augusta, Ga.
Humphreys, A. C., Phila., Pa.
Humphreys, C.J.R., Lawrence, Mass
Isbell, C. W., New York City.
King, E. J., Jacksonville, Ills.
Krumholz, J., Buffalo, N. Y.
Keuhn, J. L., York, Pa.
Leach, H. B., Taunton, Mass.
Learned, E. C., New Britain, Conn.
Lenz, E., New York City.
Lindsley, E., Cleveland, O.
Littlehales, J., Hamilton, Ont.
Ludlam, E., Brooklyn, N. Y.
Mayer, F., Baltimore, Md.
McDonald, W., Albany, N. Y.
McIlhenny, J., Phila., Pa.
McElroy, J. H., Pittsburgh, Pa.
McMillin, E., Columbus, O.
Mooney, W., New York City.
Nettleton, C. H., Birming'm, Conn.
O'Brien, W. J., Phila., Pa.
Odiorne, F. H., Boston, Mass.
Page, G. S., New York City.
Park, W. K., Phila., Pa.
Pearson, W. H., Toronto, Ont.
Perkins, J. D., New York City.
Pratt, E. G., Des Moines, Iowa.
Prichard, C. F., Lynn, Mass.
Quinn, A. K., Newport, R. I.
Ramsdell, G. G., Vincennes, Ind.
Richardson, F. S., N. Adams, Mass.
Rogers, J. F., Jamaica Plain, Mass.
Roots, D. T., Connersville, Ind.
Ross, A. Q., Cincinnati, O.
Russell, D. R., St. Louis, Mo.
Scriver, J. F., Montreal, Can.
Sisson, F. N., Albany, N. Y.
Slater, A. B., Providence, R. I.
Smedberg, J. R., Baltimore, Md.
Smith, M., Wilkes-Barre, Pa.
Snow, W. H., Holyoke, Mass.
Somerville, J., Indianapolis, Ind.
Starr, J. M., Richmond, Ind.
Stedman, W. A., Newport, R. I.
Stein, E., Phila., Pa.
Stiness, S. G., Pawtucket, R. I.
Stanley, I. N., Brooklyn, N. Y.
Stacey, W., Cincinnati, O.
Thompson, J. D., St. Louis, Mo.
Thomas, J. R., New York City.
Tufts, N., Boston, Mass.
Turner, T., Charleston, S. C.
Warmington, G. H., Cleveland, O.
Watson, C., Camden, N. J.
Weber, O. B., New York City.
White, W. H., New York City.
Wood, A. C., Syracuse, N. Y.
Young, J., Allegheny City, Pa.
Young, R., Allegheny City, Pa.

The following gentlemen, subsequently elected members, were also present:

Active Members.

Bell, H. J., Camden, N. J.
Betts, E., Wilmington, Del.
Boardman, H., Bangor, Me.
Chadwick, H. J., Lockport, N. Y.
Chollar, B. E., Topeka, Kan.
Clark, G. S., Kansas City, Mo.
Douglas, David, Savannah, Ga.
Forstall, A. E., Chicago, Ill.
Higby, W. R., Bridgeport, Conn.
McCleary, A. J., Phila., Pa.
Nute, J. E., Jersey City, N. J.
Pearson, Jr., W. H., Toronto, Ont.
Read, J., Stratford, Ont.
Rowland, C. L., Brooklyn, N. Y.
Rusby, J. M., Jersey City, N. J.
Shelton, F. H., Phila., Pa.
Stoddard, C. H., Brooklyn, N. Y.
Thomas, M. B., Dundas, Ont.

Associate Members.

Norton, H. A., Boston, Mass.
Persons, F. R., Chicago, Ill.
VanWie, P. J., Cleveland, O.
Wilson, W. J., New York City.
Wright, W. S., Chicago, Ill.

The first session was held on Wednesday, October 17th, at 10:30 A.M., the President, Mr. Thomas Turner, of Charleston, S. C., in the Chair. On motion of Mr. Slater, the reading of the minutes of the last meeting was dispensed with, the same having been printed in the American Gas Light Journal.

The Secretary read a communication from the Consumers Gas Company, of Toronto, inviting the members of the Association to attend a banquet, to be tendered by the Company at the Rossin House, on Thursday evening, Oct. 18. On motion of Mr. Somerville the invitation was accepted, with the thanks of the Association.

Applications for Membership.

The Secretary read the following applications for membership.

Betts, E., Wilmington, Del.
Boardman, H., Bangor, Me.
Chollar, B. E., Topeka, Kan.
Clark, G. S., Kansas City, Mo.
Douglas, D., Savannah, Ga.
Forstall, A. E., Chicago, Ill.
Hambleton, F. H., Baltimore, Md.
McCleary, A. J., Phila., Pa.
Nute, J. E., Jersey City, N. J.
Persons, F. R., Chicago, Ill.
Rusby, J. M., Jersey City, N. J.
Rowland, C. L., Brooklyn, N. Y.
Read, J., Stratford, Ont.
Shelton, F. H., Phila., Pa.
Williams, C. H., Waterbury, Conn.
Wilson, W. J., New York City.

Mr. Ramsdell moved that all applications for membership be referred to a committee of three to be named by the Chair. The motion prevailed, and the following committee was appointed: G. G. Ramsdell, Walton Clark and E. McMillin.

The President—The next business in order will be the reading of the report of the Executive Committee, of which Mr. White is Chairman.

Report of Executive Committee.

Mr. White—At the last meeting of the Association it was ordered that the papers to be read at this meeting should be printed, in order that while papers were being read from the platform the members might more readily follow the reading, and be better prepared to take part in the discussions following the presentation of papers. This has been done, under the direction of the Executive Committee, and the Secretary will place before you printed copies of all the papers that are to be read at the meeting, with the exception of the paper written by Captain Ross, which was unfortunately not presented to us in time to be printed. The several papers presented have been considered by the Executive Committee, and the following have been approved by them, and will be read in due course.

1. Daily Experience and Observations of a Gas Manager, by James Somerville.

2. Construction of Gasholders with Wrought Iron or Steel Tanks Above Ground, Frederick Mayer.

3. Experience in Distributing Gas under Extremely Low Temperatures, by D. H. Geggie.

4. Gas Coals, with Especial Reference to Provincial Coals, by James D. Perkins.

5. Observations During many Years' Experience in the Gas Business, by James R. Smedberg.

6. The Ross Steam Stoker and Improved Charger, by A. Q. Ross.

The Committee have adopted a programme for the meetings, printed copies of which have been placed in the hands of the members. It will be as closely adhered to as possible during the sessions of the Association.

The sum of $25 which was sometime ago placed in the treasury of this Association by a Scotch gas engineer, to be given as a prize to the writer of the best paper upon any subject which the Association might designate, has been offered by your Committee to the writer of the best paper upon "Naphthaline," which may be read at this meeting. All of the members of this Association have been notified of this fact, and have been invited to compete. It is to be hoped that a number of papers may be presented, and a decision reached, as this money has been in the treasury for some time awaiting distribution.

The subject of a permanent badge for members of the Association has been talked up at several sessions, and at the meeting in New York a committee appointed was charged with the duty of procuring designs for such a badge. The committee have been in correspondence and consultation with jewellers in New York and elsewhere, and have received from them several designs; but fearing they might be deemed too expensive that committee have come to the Executive Committee and asked for their instructions in the matter. Your committee recommend

that the committee on badges be instructed to procced with their labors, to the extent of getting a badge of suitable design, which shall not exceed in price $4. They have several designs, but, at present prices, somewhat in excess of $4. It is supposed that if an order for 200 was given the badges could be obtained for $3.50 or not to exceed $4. The Executive Committee recommend that these badges be purchased by the Association from its own treasury and presented to the members, and that hereafter new members, in paying their initiation fee of $10, shall be entitled to receive a badge from the Association. We make this recommendation because we feel that even a $4 badge may possibly not be purchased with any great degree of unanimity by the members, and that while some might have them others might not. If we desire to have a distinctive badge the committee believe that it is best for the Association itself to purchase the badges and present them to the members. We now have a surplus of nearly $3,000 in our treasury—a sum of money for which we have really only little use, as our current expenses are more than met by the current income of the Association. The committee feel that this money belongs to its members, and can be disposed of in no better way than by returning a portion of it to the members in the shape of a neat badge. It is, therefore, for you to approve our action, so that the committee on badges may be authorized to secure the badges, or else be instructed to drop the matter entirely.

The annually recurring question of proper compensation to the Secretary for his labors in our behalf has been considered by the Executive Committee, and we recommend that the salary to be paid the Secretary for the ensuing year be fixed at $600. I presume there is not a gentleman in the room having any acquaintance with the duties of that office who will hesitate to agree with us that even this salary is, perhaps, less than we ought to pay. His work is not only great and pressing, but it is increasing all the time. The matter of printing these papers has thrown an unusual amount of work upon your Secretary. The fact that, by resolution passed at the last session, we have dispensed with the services of the various papers in obtaining reports of our proceedings, and now employ our own stenographer and place upon the Secretary the duty of revision of the reports of our discussions, throws upon him an additional and onerous duty.

The Executive Committee, in carrying out your instructions on the subject of reporting the proceedings, have employed a stenographer, and the report will be made under the direction of the Association, and not under the direction of any gas journal; and any one of the journals paying its proportionate share of the cost of reporting the proceedings will be entitled to a copy for publication.

I believe, Mr. President, the Committee have no further recommendations to make at present.

The President—You have heard the report of the Executive Committee, and the various recommendations they have made. What action will the Association take upon it?

On motion of Mr. Harbison the report of the Committee was accepted and its recommendations adopted.

The Secretary read the following reports, which were, on motion of Mr. Stiness, received and placed on file:

REPORT OF FINANCE COMMITTEE.

The undersigned members of the Finance Committee have examined the books and accounts of C. J. R. Humphreys, Treasurer, for the year ending Sept. 30, 1888, and find the same to be correct.

CHAS. H. NETTLETON, W. H. PEARSON. } Finance Committee.

REPORT OF TREASURER AND SECRETARY.

Receipts.

Initiation fees	$300 00	
Dues for year 1885	10 00	
" " 1886	50 00	
" " 1887	110 60	
" " 1888	1,115 00	
" " 1889, in advance	10 00	
Interest	95 42	
Contribution for prize	25 00	
	$1.715 42	
Cash brought forward from last year	2,437 72	
Total amount to debit		$4,153 14

Expenditures.

Expenses of New York meeting	$297 38	
Salary of Secretary and Treasurer	500 00	
Printing and stationery	134 25	
Expenses of meeting of Executive Committee at New York, April 20, 1888	186 25	
Postage, stamped envelopes, and sundries	172 31	
	$1,290 19	
Cash carried forward to next year	2,862 95	
		$4,153 14

Memo. of cash on hand—

Deposit in South Brooklyn Savings Inst.	$1,240 87
" Williamsburgh Savings Bank	838 12
" Lawrence Savings Bank	634 82
" National Pemberton Bank, of Lawrence	113 40
Cash in Treasurer's hands	30 74
	$2,862 95
Due from members, including year 1889	$2,270 00

Roll call of the American Gas Light Association for the year ending Sept. 30, 1888:

Honorary Members.

Number on the roll, Sept. 30, 1887		7
Number on the roll, Sept. 30, 1888		7

Active Members.

Number on the roll, Oct. 1, 1887	310	
Admitted Oct., 1887	30	
		340
Resigned during the year	2	
Died during the year	5	
Number on the roll, Oct. 1, 1888	333	
		340

Deceased Members.

J. H. Collins, Phila., Pa.; Wm. Helme, Phila., Pa.; J. M. Murphy, Chicago, Ill.; J. C. Pratt, Jamaica Plain, Mass.; T. F. White, Houston, Texas.

C. J. R. HUMPHREYS, Sec. and Treas.

MEMORIALS.

On motion of Mr. White, the Secretary was instructed to make the proper entry upon the minutes of this meeting of the deaths of the following members of the Association during the past year:

Joseph H. Collins, Jr., Assistant General Superintendent, United Gas Improvement Company, Phila., Pa.; William Helme, Engineer Atlanta Gas Company, Phila., Pa.; J. M. Murphy, with Maryland Meter Company, Chicago, Ills.; John C. Pratt, Prest. Jamaica Plain Gas Company, Boston, Mass.; T. F. White, Treasurer and Superintendent Houston Gas Light Company, Houston, Texas.

The President—The next thing in order is the report of the Committee on Standard Meter Unions. Is the Committee ready to report?

Mr. Goodwin—The Committee will be ready to report this afternoon or to-morrow morning.

The President—I suppose the Association will grant Mr. Goodwin the time he asks. We will now hear from the Committee on Badges.

REPORT OF COMMITTEE ON BADGES.

Mr. Nettleton—I desire to say, on behalf of the Committee on Badges, that our report has practically been made already by the Chairman of the Executive Committee. As he has stated, the Committee have procured designs from some jewelers in New York and Boston, and a majority of the Committee reported unanimously in favor of one of the designs. I have the designs with me, and will be glad to show them to the members at any time during the meeting. The design selected will make, we think, a very handsome badge, and one that will please most of the members. The price asked for it ($6) is, however, somewhat higher than we think the Association ought to pay; but we believe that by ordering the large number which you have now authorized to be purchased (about 300), the badges can be obtained for $4 or less.

Mr. Harbison—I suppose there is no doubt the Chairman of the Committee can assure us that by the next annual meeting this badge will be ready for distribution among the members.

Mr. Nettleton—I have no doubt that the badges will be sent to the members sometime during the coming winter.

The President—The next business is the address of the President. I am sorry to say that I met with a very severe accident about five weeks ago, and that although I had my address then blocked out, I have not been able to devote as much care to its preparation as I would have liked, and it will necessarily be somewhat brief. I do not feel that I am in a condition to read it, and, with the permission of the Association, I will ask Vice-President Slater to read it for me.

PRESIDENT'S ADDRESS.

Gentlemen of the American Gas Light Association:—As we meet but once a year, and representing as we do such a vast extent of territory, many of the members traveling more than a thousand miles to attend the meeting, we are justified in expecting in the address of the President not only a general resume of the condition and progress of the business during the previous year, but reference to matters of importance as affecting the vast industry which has been committed to our care and management, and also such suggestions as in his judgment seemed to be worthy of occupying the attention of the Association. The consideration and discussion of technical details more properly receives attention in the various papers which are read before the Association, and in the general discussions which occur upon special points and matters which they bring to our notice. In the present instance perhaps I should apologize to the Association for attempting to say anything under the circumstances, as the time at my disposal for the preparation of an address has been limited; but knowing the feelings of indulgence which I am sure the members of the Association will extend to me, I will proceed with the consideration of such matters as have occurred to me.

First.—I desire to congratulate the members of the Association upon the general and almost unprecedented prosperity of the business during the past year. I believe there has never been greater activity made necessary in the extension of manufacturing plant than during the past one or two years. The increase in the quantity of gas distributed over that of the previous year has been from 5 or 10 to more than 30 per cent. This fact has developed the feeling among engineers, especially where the land area is limited, that we must have greater carbonizing capacity upon a given area of retort house. This is seen in the larger size of retorts used, and a greater number set in a single bench; and again in the larger gasholders constructed. The largest gasholder in America is now in process of construction in the city of New York.

Can we suggest any explanation of this large increase in the quantity of gas called for by our consumers, particularly when we know that the electric light is not an inconsiderable portion of the light now used in our large cities? I think there are several reasons which may help to explain it.

1st. The natural tendency with all consumers is toward the use of more light. This is noticeable in our own individual cases. As we grow older we require more light. As the eye becomes accustomed to a strong light it produces conditions whereby a still stronger light is necessary.

2d. The low price at which gas is sold, in the large cities especially, allows of more freedom and more extended use of gas. It is an acknowledged fact that the cheaper any of the necessaries of life are, and even what are called luxuries, too, the more will be used, and less pains will be taken to curtail their use.

3d. The use of gas for cooking and heating is constantly increasing, and will go on increasing in a greater ratio than heretofore. As our consumers come to realize the comfort, convenience, economy, and utility of a good gas stove or range, and which are now attainable in all our large cities, they will wonder how they ever lived without it.

4th. The application and use of electric light has really had the effect of almost compelling people to have more light; and for this reason we can afford to be generous and give electric light credit for its assistance in increasing our sales of gas. In fact, I think I am not magnifying the conditions when I say that, had the people of all our cities required and demanded the quantity of artificial illumination, together with the quantity of gas now used for other purposes than illumination, and the electric light unknown, the gas companies—with the aid of all the present gas works construction companies, and individuals pursuing that line of business, doing their utmost—would be severely taxed to keep the gas plants of the country in a condition to supply it. Even now some of the larger companies have been forced to make strenuous efforts to keep their works in the necessary condition to get through the winter. I am aware the market price of gas stocks has at times suffered from the progress electric light has made and is making; but the business as a whole has not suffered, but rather increased.

Some gas companies and gas engineers have pursued the policy of, as they say, "fighting" the electric lights. This I regard as a mistaken policy. No gas company or gas manager can afford to stand in the way of the development and march of improvements of any kind. Development and improvement is the order of the day in this age. The world must go forward, onward, and upward toward perfection; and the man or men who would endeavor to stop the wheel of progress, in any direction, does or do not comprehend the tendency or drift of things in the age in which we live. The electric light has its advantages. Let us acknowledge them. It also has its defects, which are ample enough to interfere with its progress to that extent which will drive gas from its full share in the business of artificial illumination, to say nothing of its use for heating, which has even now hardly begun.

Our true policy, then, is rather to lend our energies to the development of the possibilities in our own business which are still greater, I believe, than most of us are aware of to-day; and you may be sure that in the future we shall hear from the young men who have chosen our profession for their life-work, and are being educated especially for the work, rather than to drift into the business from accident, as many of us did years ago when the business was comparatively new in this country.

It may not be improper to remark that when we stop to consider the persistent experiments and research made, particularly during the last ten years, by men of eminent ability and special education and training for the work, and the amount of money expended in the development of the science of electricity as applied to the production of artificial light since its first introduction, the wonder is that the gas industry is in existence to-day. This fact alone would seem to be sufficient evidence that illuminating gas has qualities inherent in itself, and that when the same energy and scientific ability, together with the experience of the past, are applied to its further development, it must still remain, as it has been in the past, the light best adapted, all things considered, for universal artificial illumination and heating. As a rule, the gas business has not been managed by men who have had special education and training for the work before engaging in it; but I am glad to know that a gradual but sure change is already upon us; and I am certain that the business of gas manufacture will receive a fresh impetus when the young men who are now coming up, with especially trained minds and hands, bend their energies to the work of developing the science of manufacture of illuminating, and, I may add, heating gas.

There are many gas engineers and managers who warmly advocate the policy of amalgamating the business of electric lighting with the gas light business. I must say I am not entirely of that opinion. I cannot see why gas companies should engage in the electric lighting business any more than they do in the kerosene oil and candle business, simply because kerosene oil and candles furnish light. There is ample room for us all. I do not think any man can manage two different kinds of business, entirely dissimilar in many respects, as he can one; especially when we consider that with the one he is entirely familiar and the other is entirely new to him. One or the other must, in some degree, be neglected; perhaps both. At the same time, I am willing to acknowledge that, in some instances, advantages would accrue to both interests if consolidated. Local circumstances and conditions will generally settle the policy of consolidating the two interests, and wise managers will be governed by the circumstances rather than by the questionable policy of endeavoring to monopolize the entire business of supplying artificial light.

With the progress of the business during the past year, then, we may be fairly satisfied and take encouragement for the future. At the same time we must be diligent and work with renewed energy and spirit; for it is to the intelligent worker, rather than the talker, that success is most likely to come.

No radical changes as especially marked improvements in manufacture have been brought out during the past year; but there has been a general improvement, particularly in the older works where old apparatus has been replaced with new and improved sorts; the construction of new benches, with larger and increased number of retorts in a bench, and also adopting some form or kind of generator or regenerator furnace, all of which tend to largely increase the product of the retort house, with marked economy in the consumption of fuel.

With the best known apparatus of the present day, and the handling of coal, coke, etc., by machinery, as is now done in some of the large modern works, the day of dollar gas is not far distant; and is even now reached in some cities where conditions are favorable. As I have already said, we may expect marked improvement in working results and utilization of residual products to be derived from more accurate information which will be brought to bear by the young men who are being thoroughly educated and trained for the work. If the business has prospered during the past thirty or forty years and in the hands of men who, as a rule, had no special training or technical education necessary for it, but who were brought into it more by accident or circumstances than knowledge of the business, what may we expect when the conditions are changed and the carbonization of coal and the treatment of the resultant gases are more thoroughly understood and more definite and positive results assured?

Much has been written and said upon the subject of naphthaline; and yet, where is the man to-day who can accurately foretell all the conditions which conduce to its appearance, or its remedy when present?

It is true that many remedies have been suggested, and in some cases, where certain conditions have been observed, it has not appeared in its crystallized form; and yet, in other places, where the same conditions have apparently been maintained, it has been deposited in increased quantities. One is troubled with naphthaline when he uses certain kinds of coal; another uses the same kind of coal and is never troubled with it; but when he uses some other kind of coal it always puts in an appearance. We all know very well that, as a scientific principle, like causes always produce like results, consequently such arguments go for nothing, because there must of necessity be some cause or conditions in one case that do not obtain in the other.

Much is yet to be learned in the retort house. The almost universal rule seems to be now to produce high heat in the retorts and charge them with all the coal they will burn off, without any special care as to the character of the coal or the length of time it remains in the retort. If six-hour charges are run, the coal must remain in the retorts just six hours, even if the gas is all worked off in three or four hours. From one kind of coal the gas may be worked off in three hours, another will require four or five hours under the same heat, so that we have the problem before us still, of being able to produce certain results from certain kinds of coal—not only the certain results, but the best possible results which can be theoretically obtained from the coal. Whether the present form of retorts and the present method of carbonizing the coal are the best are questions which still remain unanswered. Although many attempts have been made and much experimenting has been done without successfull results, yet the continuous carbonization of the coal is a thing still to be hoped for. Whether this and other radically new ideas are to be practically developed by the theorist, or by the practical man, is a question; but probably through the aid of both.

The engineer in charge of large works has little time at his disposal for experimenting, and he who has only the chemical laboratory for his work has not the advantage of working out his ideas practically and on a large scale; but the engineer who is to be the most successful in the future is he who has taken the advantage of a thorough technical education coupled with actual practical ability and application. It is one fault of our system of education that the young man who is kept at school until he is prepared for the university or technical school often grows up without the advantage of the experience which comes only from actual work with his own hands, and so never acquires that practical judgment which must needs accompany a theoretical education in order to place him in the best possible position as a manager of any great industrial establishment.

This is one preeminent reason why, in the past, the man who has had practical experience, learned a trade and worked with his own hands has been, as a rule, more successful than the one who has acquired a theoretical education and has never had the advantage of practical experience in the work, and so never had his judgement and practical ability developed as does the man who has, perhaps, been compelled to work with his own hands. Theory and practical judgment and ability must go together, if we would secure the best results.

Without doubt the English, French and German engineers, in the past, have had the advantage of a more thorough technical education and training than have the majority of American engineers; but the standard of comparison in this country is being rapidly reached through the various institutions which are fitting the young men for the active duties of engineer or manager of our special industry.

There are many matters which I might refer to, some of which will be brought before you in the several papers, which have been prepared for this meeting by gentlemen of experience and ability, and which will be presented in a more acceptable form than I could hope to do; but I have already taken too much of the time of the Association. Yet I cannot conclude without referring to the great work which has been accomplished by this Association, the proceedings of which have been published and are preserved in a permanent form, the reading of which is of absorbing interest even to the members who have attended all the meetings. But all the results of our meetings have not been published, and never can be. The acquaintances made, the enduring friendships formed, the little private interviews and conversations which have taken place upon all the multitudinous matters that a gas engineer has to deal with, all go to make up the sum total of the benefits which have been derived from attending our meetings, and have served to largely increase the prosperity of the companies we represent.

Many members have grown old in the service of their company, some have dropped from the roll by death, some have been disabled by accident, while others have reached an age which disqualifies them from active participation in the management of the business, and their familiar forms and faces are missed in our gatherings. New members are constantly being admitted to the duties and privileges of membership in our Association, and those now present will, one by one, pass over and "join the silent majority." During the past year several of our members have gone from us, due notice of which will be taken by the Association, and a proper minute will be placed on our records.

Let us strive to do our work well; and when we are obliged to step out of the scenes of active work and duty, which others will take up and go forward with, let it be said of us that our record and work is worthy of emulation.

The President—What action will the Association take as to the address?

Mr. McMillin—I am sure we all sympathize with our President in his recent affliction, and sincerely trust that he may never meet with such another accident. I move the address be referred to a special committee, with instructions to report thereon during this session of the convention.

The motion prevailed, and the Chair appointed as such committee, E. McMillin, A. C. Wood and James Somerville. The committee subsequently submitted the following report, which was accepted and ordered placed on file.

Report of Committee on President's Address.

To the Members of the American Gas Light Association:—Gentlemen: Your Committee, to whom was referred the President's address, submit the following report:

We find that the subjects mentioned in the address were exhaustively treated, and nothing that we could say would add either to the force of the President's suggestions or to their elucidation.

We recommend that the Secretary make a proper record in his journal of the deaths that have occurred, and that he prepare and publish, with the proceedings in the bound volume, a memorial for each of the members who died during the past year. Respectfully submitted.

E. McMillin,
A. C. Wood,
Jas. Somerville, } Committee.

Appointment of Committees.

The President appointed the following committees:

On Nomination of Officers.—S. G. Stiness, Pawtucket, R. I.; E. J. King, Jacksonville, Ills.; G. S. Hookey, Augusta, Ga.; Marcus Smith, Wilkes-Barre, Pa.; Jos. Krumholz, Buffalo, N. Y.

On Place of Meeting.—Frederick Mayer, Baltimore, Md.; Robert Baxter, Halifax, N. S.; John P. Harbison, Hartford, Conn.; Robert Young, Allegheny, Pa.; Jas. Somerville, Indianapolis, Ind.

Amendments to the Constitution.

The President—We will now hear the report of the Executive Committee on proposed amendments to the Constitution.

Mr. White—I have the pleasure of reporting, in behalf of the Executive Committee, a new Constitution, which is submitted in print for your examination and approval. The Executive Committee, having had this matter placed in their charge by the Association, have held several meetings for the consideration of the subject; and the Secretary has been more than energetic in procuring from various sources matter that might be of use to the committee in preparing this form of Constitution. It has seemed desirable to the committee that such a form of Constitution should be secured for this body as would not have to be hauled up for amendment and worked at, to the exclusion of other and more important business, at every meeting of the Association. In offering this the committee assure the Association that they have worked very diligently in the effort to obtain something which seemed to them to cover all requirements of the Association. We trust that no more time will be occupied this morning than is necessary in settling this matter once for all.

The President—What action will the Association take on the report of the committee?

Mr. King—I suggest that the Chairman read simply the changes which have been made in the Constitution.

Mr. White—That would be almost impossible, there are so many.

Mr. Harbison—I move that the Chairman of the Executive Committee read the Constitution recommended by the Committee for our consideration and adoption.

The motion prevailed, and Mr. White read the proposed Constitution as follows:

Constitution of the American Gas Light Association, as Reported by the Executive Committee, Oct. 17, 1888.

I.—*Name.*

1. The name of this Association shall be the American Gas Light Association.

II.—*Objects.*

2. The object of this Association shall be the promotion and advancement of knowledge, scientific and practical, in all matters relating to the construction and management of gas works, and the manufacture, distribution and consumption of gas.

3. The establishment and maintenance of a spirit of fraternity between the members of the Association by social intercourse and by friendly exchange of information and ideas on the before-mentioned subject matters.

4. The inducement and extension of more cordial and friendly relations between the manufacturers of gas and their patrons, based upon the mutuality of interests.

III.—*Members.*

5. The members of this Association shall consist of three classes—Active, Honorary and Associate Members.

6. To be eligible as an Active Member a person must be a president, secretary, treasurer, engineer, consulting engineer, or superintendent of a gas company, or a manager of a gas works.

7. Associates shall be persons holding a responsible position in a gas works, or persons whose pursuits constitute branches of gas engineering, or who are otherwise qualified to assist in promoting the objects of the Association.

8. Honorary Members shall be gentlemen whose scientific or practical knowledge in matters relating to the gas industry, and whose efforts and interest in that behalf shall recommend them to the Association.

IV.—*Election of New Members.*

9. Every application for membership shall be made in writing to the Secretary, endorsed by two Active Members, and must be accompanied by a statement in writing of the grounds of the application, and an agreement that he will conform to the requirements of membership if elected. Application shall be made upon a printed form supplied by the Association, and shown in Schedule A, appended to these rules.

10. The preceding rule shall apply equally to any person soliciting admission as an Associate Member, application to be made upon a form, as shown in schedule B, appended to these rules.

11. It shall be competent for any Associate Member to apply to the Secretary to be transferred from the class of Associate Members to that of Active Members. Such application shall be submitted to the Council, who may, if the applicant is eligible to active membership, recommend the transfer for approval at the next meeting of the Association, the application to be made on a form to be supplied by the Association, as shown in Schedule C.

12. Application for Active Membership, or for Associate Membership, or for transfer from Associate to Active Membership, must be received by the Secretary at least ten days prior to the meeting at which the application is acted upon.

13. Honorary Members shall be proposed by the Council, at a general meeting of the Association.

14. An applicant for admission to any class of membership, or for transfer from one class to another, must receive the votes of two-thirds of the members present to be elected.

15. If any person, proposed for admission to the Association, or for transference from the class of Associate to that of an Active Member, be rejected, no notice shall be taken of the proposal in the minutes.

16. Any person elected to the Association, excepting Honorary Members, must subscribe to the rules and pay to the Treasurer the initiation fee before he can receive a certificate of membership. If this is not done within six months of notification of election, the election shall be void.

V.—*Management.*

17. The affairs of the Association shall be managed by the Council, subject to the control of the general meeting.

18. The Council shall consist of the President, three Vice-Presidents, eight Active Members, and the President or Acting President of the preceding year. The Secretary shall also be, *ex officio*, a member of the Council. Five members shall constitute a quorum.

19. The Council shall appoint from their own number, immediately after the meeting at which they are elected, a Finance Committee of three members.

VI.—*Election of Officers.*

20. The President, Vice-Presidents, Secretary and Treasurer shall be elected annually.

21. Four Active Members of the Council shall retire each year.

22. All elections shall be by ballot.

23. The President and the four retiring Active Members of the Council shall not be eligible for election the following year.

24. Previous to each annual meeting it shall be the duty of the Council to appoint a Nominating Committee of five members. It will be the duty of the Nominating Committee to present at the annual meeting a list of Active Members whom they recommend as officers for the ensuing year.

25. No member of the Council shall be eligible as a member of the Nominating Committee.

26. The Council shall have power to fill vacancies in its own body.

VII.—*Duties of Officers.*

27. The officers-elect shall assume office immediately after the meeting at which they have been elected.

28. The President shall take the chair at all meetings of the Association or committees at which he is present.

29. In the absence of the President one of the Vice-Presidents shall take the Chair, and in the absence of the President and Vice-Presidents a Chairman shall be appointed by the Council from the members of the Council.

30. The duties of the Secretary shall be to take minutes of all proceedings of the Association and of the Council, and enter them in proper books for the purpose. He shall conduct the correspondence of the Association, read minutes and notices of all the meetings, and also papers and communications, if the authors wish it, and perform whatever duties may be required in the Constitution and By-Laws, appertaining to this department.

31. The duties of the Treasurer shall be to receive and keep all annual dues and funds of the Association, to keep correct accounts of the same, and pay all bills approved by the President or a member of the Finance Committee, and he shall make an annual report to be submitted to the Association.

32. The duties of the Finance Committee shall be to audit the books, accounts, and statements of the Treasurer; to invest the funds of the Association, and to care generally for the finances of the Association, subject to the control of the Council.

33. The duties of the Council shall be to have the general management of the affairs of the Association, to designate the writers of papers at each meeting, and the subjects to be discussed, and to prepare for the meetings of the Association. The Council shall have the power to appoint, from time to time, a Committee of Arrangements from among the members, to assist the Council in arranging for the meetings of the Association.

VIII.—*Meetings and Proceedings.*

34. The annual meeting of the Association shall be held on the third Wednesday of October of each year, at 10 o'clock A.M., at such place as shall be designated by the Association at the previous meeting.

35. At the annual meeting of the Association the order of business shall be: (1) the reading of the minutes of the last meeting; (2) the report of the Council on the applications for membership, and for transfer of membership; (3) the election and introduction of new members; (4) the report of the Council on the management of the Association during the previous year; (5) the report of the Treasurer and of the Secretary; (6) reports of Special Committees; (7) election of officers; (8) the address of the President; (9) reading of papers, and discussion on the same; (10) general business.

36. At other general meetings of the Association the order of business shall be the same, except as to the 4th, 5th and 7th clauses.

37. The Secretary shall send notices to all members of the Association at least 14 days before each general meeting, mentioning the papers to be read, and any special business to be brought before the meeting.

38. Special meetings may be called at the option of the Council, and the Secretary shall call a special meeting on the written request of 20 members. The notices for special meetings shall state the business to be transacted, and no other shall be entertained.

39. Thirteen members shall constitute a quorum.

40. All questions shall be decided by any convenient system of open voting, the presiding officer to have a second or casting vote when necessary.

41. Questions of a personal nature shall be decided by ballot.

42. Any member, with the concurrence of the presiding officer, may admit a friend to each meeting of the Association, but such person shall not take part in any of the discussions unless permission to do so be given by the meeting.

43. All papers read at the meetings of the Association must relate to matters either directly or indirectly connected with the objects of the Association, and must be approved by the Council before being read.

44. All papers, drawings or models submitted to the meetings of the Association shall be and remain the property of the authors.

45. The Council shall meet before each general meeting of the Association, and on other occasions, when the President shall deem it

necessary. Of such special meetings reasonable notice shall be given by special call, in print or writing, specifying the business to be attended to. The President shall be requested to call the Council together on the written request of five members of the same.

IX.—*Privileges and Duties of Members.*

46. Every person elected as an Active Member shall pay an initiation fee of $10, which shall include the dues for the current year.

47. Every person elected as an Associate Member shall pay an initiation fee of $10, which shall include the dues for the current year.

48. Every Active Member shall pay annually, in advance, the sum of $5.

49. Every Associate Member shall shall pay annually, in advance, the sum of $5.

50. Honorary Members shall not be required to pay an initiation fee, nor annual dues.

51. No member who owes for two years' dues shall be entitled to vote, or to participate in the deliberations of the Association, or to receive a copy of the proceedings.

52. Any member may retire from the membership by giving written notice to that effect to the Secretary, and the payment of all annual dues to date, unless released from said payment by a vote of the Council.

Any member whose dues shall remain unpaid for a term of three years, may be dropped from the roll of membership by a vote of the Council.

53. A member dropped from the roll for non-payment of dues, may, upon paying the amount he owes the Association, be reinstated at the option of the Council.

54. Any member may compound for his annual payments by paying $50 in one sum.

55. Each member of the Association shall be furnished by the Secretary with a copy of the proceedings of the Association for the current year, and the Constitution, and also a list of the names and address of the members.

56. A member may be expelled from the Association by a recommendation to that effect made by the Council at any general meeting of the Association.

The vote shall be by ballot, and shall require two-thirds of the votes cast for its adoption.

57. An Associate Member will be entitled to all the privileges of the Association, except voting and holding office.

58. An Honorary Member will be entitled to all the privileges of the Association, except voting and holding office.

Amendments.

59. All propositions for adding to or altering any of the provisions of the foregoing Constitution shall be laid before the Council, who may bring it before the next general meeting of the Association, if they see fit, and the Council shall be bound to do so on the requisition, in writing, of any five members of the Association. All propositions to amend this Constitution to be decided by ballot, and shall require two-thirds of the votes cast for its adoption.

Discussion.

Mr. White—We submit this Constitution as our report, and as the result of our deliberation. I move its adoption as a whole.

Mr. Stiness—I second the motion.

Mr. Harbison—Before that motion is put I beg to suggest that the Committee on applications for membership present their report, because if this Constitution is adopted now, some of the names that have been presented to the Committee may be reported upon as not entitled to come in now. I, therefore, move that this proposed Constitution be laid upon the table in order that we may hear the report of the Committee on new members.

The President—Is the Committee on applications for membership ready to report?

Mr. Ramsdell—At the meeting held in New York one year ago it was understood that we were to receive no further associate members, except under the provisions of this new Constitution. In the list of applications handed in this morning there is but one that comes under that head, and that is the application of Mr. William J. Wilson. The other applicants are entitled to come in as active members under either the old or the new Constitution.

Your committee, therefore, approve all the applications for membership except that of Mr. Wilson, and suggest that his application be laid over until final action is had on the adoption of the new Constitution.

Mr. Harbison—Does the committee recommend that these applications come in under the new Constitution, and be acted upon at this meeting.

Mr. Ramsdell—Yes.

Mr. Harbison—I would like to have that understood, so that they will not be left until next year.

Mr. Ramsdell—Another application has just been handed me, that of Mr. W. H. Pearson, Jr., of Toronto. He would come in as an active member.

Mr. Harbison—I move that the report of the committee on new members be accepted, and that the Secretary cast the ballot of the Association for the names of the gentlemen recommended by the committee.

The motion prevailed. The Secretary cast the ballot of the Association accordingly, and all the applicants for active membership were declared duly elected.

Mr. Harbison—Now I move that we take from the table the proposed Constitution, and I second the motion for the adoption of the Constitution as read.

Mr. McIlhenny—This is too important a document to be adopted without any discussion; and I think the proper way would be to receive it and then proceed to discuss it, either in parts, or as a whole.

Mr. McMillin—I raise the point of order that, as the present motion is to take it from the table, it is not now open to discussion. We must take it from the table before we can discuss it.

The motion to take from the table prevailed.

The President—The proposed Constitution is now before us for our consideration.

Mr. White—There seems to be a lack of understanding as to the status, under this new Constitution, if adopted, of some of our members, who are not actually engaged in the gas business, and who would, if proposed for membership under the new Constitution, come in as associates, and not as active members. Nothing that this Association can adopt in the way of a Constitution will affect the standing of any present member. He is still an active member. The idea is to divide all future applicants for membership into two classes—active and associate. All of the present members, no matter in what way they are connected with the gas industry, remain as active members, and there is nothing in the Constitution which can in any way affect their present standing.

Mr. McIlhenny—Is the Constitution now before the Association?

The President—It is now before the Association for adoption as a whole, as I understand the motion.

Mr. McIlhenny—There is one clause in it to which I wish to call attention, and it is not in regard to the status of existing members, because, of course, their rights cannot be taken away from them by any action we may now take with reference to this Constitution. I wish to call attention to this particular clause:

"It will be the duty of the nominating committee to present at the annual meeting a list of active members, whom they recommend as officers for the ensuing year."

If I recollect rightly it has been the practice of this Association to appoint a committee for the purpose of nominating the officers. If I am not correct in this I wish to be corrected. The object of appointing this committee to name the officers has been to save the time of the Association. But now it is proposed to make this method of selecting officers a part of the fundamental law; and it takes away from individual members the right of nomination. I believe it is the practice in all legislative bodies to accord to every member the right to make nominations. Will not the adoption of this Constitution take away from us that right?

Mr. White—No, sir.

Mr. Harbison—If the gentleman will notice the provisions of the Constitution he will see that the Council appoint the nominating committee—the President presiding at the meetings of the Council. The custom now is for a motion to be made that the President appoint a committee on nominations, and the President thereupon appoints such committee, as has been done this morning. The new Constitution provides that the Council (the President being in the Chair) shall name a nominating committee—no member of which committee shall be a member of the Council. So that the Council must go outside of their own members in selecting the committee on nominations.

Mr. McIlhenny—I understand that, but that does not meet my objection.

Mr. Harbison—This method saves the time and the necessity of a motion that the President appoint such a committee.

Mr. McIlhenny—But my point is that this clause of the Constitution gives to this committee the right to nominate officers, and takes from individual members the right of nomination.

Mr. Harbison—This will not take from the Association the right of substituting on the nominating committee other members than those named by the Council; and it does not prevent any member of the Association from making any addition to the number of nominees made to the Council by the nominating committee. The object is simply to facilitate business, and it is not the intention to take away any right from any member.

Mr. McIlhenny—I understood from the reading of this that when this committee comes in with its nominations the Association only has a veto power. It requires a vote of two-thirds of the members present to sanction the nominations made by the committee; but there is nothing said about the right of members to make nominations. I think it would be better to have that right of nomination stated in express terms.

Mr. A. C. Humphreys—I think if the gentleman will read the paragraph again he will see that his point is covered, for this committee are simply to present "a list of active members, whom they *recommend* as officers for the ensuing year."

Mr. Thomas—I think it would be a good idea to have this matter lie over until to-morrow morning so as to give all the members an opportunity to read the proposed Constitution, and understand what they are going to adopt. There seems to be a difference of opinion in relation to it, and a good many do not understand it. I do not know why the President is not just as competent as the Council to appoint a nominating committee, or why the members themselves are not entirely competent to name their officers. If action on the Constitution is postponed until to-morrow morning, all of the members will be afforded an opportunity of reading and understanding it, and will then be prepared to vote intelligently upon it.

Mr. King—It seems to me that in reading this Constitution one cannot fail to be impressed with the idea that the Committee have done their work very thoroughly. They seem to have considered every point; and I, for one, am willing to take the result of their deliberations just as they have presented it to us—although I think I can see several points that may give us trouble in the future. But they have certainly discussed those points among themselves, and have arrived at their conclusions, and I, for one, am willing to accept their view of the case. If we enter upon the discussion of the Constitution, and take up all the debatable points, it will occupy all the time of this meeting. It therefore seems to me it will be better to adopt it as it stands; and hereafter, if we find it does not work just as we had hoped, it can be amended.

Mr. Stedman—I would like to call attention to the second section of par. 45: "The President shall be requested to call the Council together on the written request of five members of the same." I call attention to the repetition of the word "request," and suggest that the first "requested" was intended to be "required."

Mr. Harbison—If there is any mistake of that kind, the Secretary can make the correction.

The President—The pending motion is on the adoption of the Constitution as reported by the Executive Committee. Are you ready for the question?

The motion prevailed, and the Constitution was declared adopted.

The Secretary—I have another application for associate membership—that of Mr. H. A. Norton, of Boston, Mass.

The President—Let it be referred to the same committee.

Mr. Ramsdell—The committee make the same report as to this application.

Mr. Harbison—I move that the recommendation of the committee on membership on the applications of Messrs. Wilson, Pearson and Norton be adopted and that the Secretary be instructed to cast the ballot of the Association for the election of Messrs. Wilson and Norton as associate members, and Mr. Pearson as an active member, so that they may come in with the rest under the present Constitution.

The motion prevailed, and the three applicants named were declared duly elected.

An Invitation.

The President—Mr. Pearson, of the Committee of Arrangements, has something to say to the Association.

Mr. Pearson—Gentlemen, I welcome you to the good city of Toronto, personally, and also on behalf of the Company which I represent. I trust that your stay may be pleasant, and that none of you will regret coming. My object in addressing you now is to ask that all the members of the Association who intend to be present at the banquet to be tendered by the Consumers' Gas Company, on Thursday evening, will be kind enough to give their names to Mr. Cartwright, who will be on the platform at the close of this meeting. We ask you will do this promptly, as the hotel-keeper desires to know as nearly as possible how many will be present. I trust that every member of the Association will accept the invitation. Those who give in their names this morning will receive their tickets at the close of this afternoon's session.

Report of Committtee on Place of Meeting.

Mr. Mayer—The Committee appointed to recommend the place for holding the next meeting of the Association instruct me to say that we unamimously recommend that the next annual meeting be held in the city of Baltimore.

On motion of Mr. White, the Association concurred in the recommendation of the Committee.

Committee of Arrangements.

On motion of Mr. Harbison, the President appointed as a Committee of Arrangements for the next meeting the following:

Frederick Mayer, Baltimore, Md.; F. H. Hambleton, Baltimore, Md.; Charles H. Dickey, Baltimore, Md.; John P. Harbison, Hartford, Conn.; William Henry White, New York, N. Y.

Another Invitation.

Mr. Pearson—The Government Gas Inspector of Toronto has requested me, on his behalf, to invite the members of the Association to visit his office, where he will be most happy to show the various apparatus used in testing gas. His office is at No. 10 and 12 Toronto street, and I think you will be interested in visiting him.

The Convention then took a recess to 2:30 P. M.

First Day—Afternoon Session.

The Association met at 2:30 P. M.

The President—The first business this afternoon will be the reading, by Mr. Pearson, of a description of the Lux Gas Balance.

Mr. W. H. Pearson, of Toronto, then read the following description of the latest improved form of

THE LUX GAS BALANCE.

The ordinary methods hitherto employed for determining the specific gravity of gas, are the "Direct Method" of weighing, in which process, as you are aware, a hollow vessel is weighed by means of a very sensitive scale, first in the exhausted state, afterwards when filled with air, and lastly, when containing the gas to be examined—the specific gravity of the gas is then ascertained by dividing the weight of the gas by that of the air; and the "Effusion Test" of Bunsen, based upon the fact that if gases are expelled under the same pressure, through a small aperture made in walls of minute thickness, the squares of the velocity of the expulsion are in inverse ratio to the specific gravity of the gases.

Recognizing that these, and other methods, all have the serious drawback that they require so much time to make them, as well as skill on the part of the operator, Mr. Lux set about devising an apparatus by the aid of which the specific gravity of gas might be ascertained in the same automatic way in which it is possible to ascertain temperature and pressure by means of the thermometer and the barometer, and the specific weight of liquids by the hydrometer. He first constructed what he called the "bareometer," based upon the Archimedean principle, a description of which is given in his pamphlet, which, though he found on the whole to satisfactorily answer the purpose, he delayed presenting to the public, from fear that it might be too fragile for ordinary use—the globe being of glass; and because, under certain conditions, water or any other liquid would be unavailable for the test. He then directed his efforts toward the solution of the problem by means of the principle upon which the common lever balance is constructed, and claims that in devising the "Gas Balance" he has accomplished the task to his entire satisfaction.

Mr. Lux claims that, with the aid of this balance, the specific gravity of any gas can be determined to within .001.

The apparatus, which is a beautiful construction, consists of a pillar or stand, divided at its upper extremity into two branches, forming a kind of fork. Fixed in the top of these branches, on either side, is an agate plane, upon which the beam of the

balance is made to rest, upon a knife edge. The beam consists of a central body to one end of which is fixed a hollow globe of metal, containing about one liter (1/28th of a cubic foot), while at the other end is a scale divided into 120 parts, provided with a rider or counter weight. From the upper extremity of the central body two narrow tubes issue, at right angles, to the plane of oscillation, one of which enters the tube, which practically constitutes the continuation of the beam of the balance, inside of the globe, while the other enters the globe directly through the annular orifice in the central body. These two tubes are bent, at their outer ends, at right angles, in a downward direction, and terminate in small saucers, which, being filled with mercury, constitute an effectual hermetic seal. In order that any solvent action which the mercury might have upon the metal may be evaded, the ends of the tubes, and also the saucers, are made of ivory. Through the mercury a small tube enters from below into each of the saucers, and terminates in a joint piece. It will thus be seen that the gas introduced enters through one of the tubes, one of the saucers and one of the annular tubes, into the globe, thence passing through it continuously, leaving the globe through the annular tube at the other end, and finally passing through the second annular tube, mercury saucer and outlet tube.

There are two adjusting screws fixed in the center of the beam, one horizontal and the other vertical, which constitute the pivots of the whole system. By turning the vertical screw up or down, the center of gravity of the balance can be fixed at a longer or shorter distance from the center of motion, thus lessening or increasing the sensitiveness of the instrument. By turning the horizontal screw the balance is so adjusted that the weights on either side of the central fulcrum are identical.

There is an arched scale, fixed at the base of the standard of the balance, with forty divisions (twenty on the plus side, and twenty on the minus) in front of which is a steel pointer. The divisions on this scale are equivalent to those on the beam, and are positive on the right and negative on the left.

A thermometer is fixed to one of the arms of the pillar, and a pressure gauge, partially filled with glycerine, on the other. Underneath the case are adjusting screws, to enable the operator to fix it in a perfectly horizontal position. The apparatus is placed in a case to prevent the action of the air affecting the balance, which is extremely sensitive, and also to keep it clean.

To prevent any moisture or tarry matter from entering the globe, a gas filter, containing cotton wadding, is provided, through which the gas passes before entering the balance.

The working of the apparatus is very simple and easily understood. In making a test, the beam being arrested (by means of a button in front of the case) before filling the globe with gas, the sliding weight is put upon point 1, on the beam scale. The arrestation is then raised, and the balance adjusted by means of the screws on the top of the beam already referred to, until the motion of oscillation of the steel pointer to the ivory scale is 0. After being properly adjusted, the beam is again arrested and the sliding weight placed, for example, upon .8. As the divisions on the ivory scale should be of the same value as those on the beam, the steel pointer ought to go to plus .2, because .8+.2=1, as above. If this is not found to be the case, the balance is again adjusted, by means of the screws, until properly regulated.

If it is intended to test coal gas, its specific gravity ranging from, say, .350 to .500, the sliding weight may be removed from .1 to .4, and to ascertain the specific gravity, the arithmetical mean of the oscillation of the pointer upon the front of the ivory scale is to be taken, which, if on the plus side, is added to, and if on the minus side deducted from, the indication of the sliding scale. This will give the exact specific gravity of the gas. For instance, if after raising the arrestation the steel pointer oscillates between +.8 and +.12 the arithmetical mean being .10 (which represents .1) specific gravity is found to be .4+.1=5. If the steel pointer should oscillate, say between +.5 and +.10, the specific gravity would be +.4+.075=.475. In the case of an examination of gas of a higher specific gravity, say, between .500, .600, or .700, the slide may be placed upon .5, .6, or .7, as the case may be. Heavy gases can be tested by putting two sliding weights on the beam scale.

Once properly regulated, the apparatus can be ready for use at any time without further re-adjustment, and, if desired, the gas, under a low pressure, can be allowed to pass through it continuously and the specific gravity can at any time be ascertained in a minute or two. This obviously is a very great advantage. Whenever necessary the balance can be readily re-adjusted in from ten to fifteen minutes.

This balance was exhibited at the last meeting of the English Gas Institute, where it was favorably received, and Mr. Lux has written informing me that he has just obtained the highest distinction (the gold medal) at the Brussels International Exhibition for his collection of gas balances.

Discussion.

Mr. Geggie—Does Mr. Lux say whether it can be used for testing for sulphuretted hydrogen and carbonic acid, as well as for ascertaining the specific gravity?

Mr. Pearson—No.

Mr. Geggie—I think it can be used for that purpose also.

Mr. Pearson—I think not for testing for sulphuretted hydrogen. It will be useful in determining whether there would be carbonic acid in the gas, because the extra weight of gas, as shown by the test, would indicate its presence; but I have not heard that he has used it for the purpose of testing for sulphuretted hydrogen. He uses another appa atus for that purpose.

Mr. Somerville—It seems to me the accuracy of the test depends upon the friction of the movement. If it should be a little stiff it would not be accurate.

Mr. Pearson—The construction of it is such that it seems almost impossible for it to get stiff.

Mr. Somerville—I suppose it should be kept in a dry room.

Mr. Pearson—It is intended that the filter shall remove almost all of the moisture. Of course the presence of moisture would affect it. Mr. Lux states, from a number of tests made, he has ascertained that the very small quantity of moisture present is of very little account, and does not interfere with the accuracy of the balance. I think this is the fourth balance that Mr. Lux has made. He has made quite a number, and he claims that this is practically perfect.

Mr. Somerville—Does it keep an automatic record of the specific gravity?

Mr. Pearson—He has another apparatus arranged in such a way as to keep a record, but this one is not of that type.

Mr. Diall—What is the price of it?

Mr. Pearson—I do not know. Mr. Lux claims that it will be especially useful in testing the gravity of furnace gases. Probably it will be more useful for that than for testing ordinary gas. You see that his claim is a very strong one. He claims that with this particular apparatus he can ascertain the specific gravity of gas within .001 part, which is near enough for anything we might need.

Mr. McMillin—I probably owe the Association an apology for asking the question, but I did not pay very close attention to the reading of the paper. May I ask if the object of the balance is chiefly to determine the quantity of carbonic acid.

Mr. Pearson—It is chiefly to determine the weight of the gas.

Mr. McMillin—Of what advantage would that be to us?

Mr. Pearson—Probably you can tell that as well as anybody else.

Mr. McMillin—I do not see that it makes much difference whether a given quantity of gas weighs a pound or an ounce. I might care to know what it was composed of, but be indifferent as to its weight. That question, however, was with the view of leading to another, and that is—to determine the quantity of carbonic acid by testing the specific gravity, what would be the effect of running extremely high heats and decomposing a good deal of the marsh gas—thus removing a large per cent. of hydrogen, but leaving carbonic acid in it? Would it not have about the weight of a good gas, and still be of very poor quality? If that be so it would not be an absolute test as to whether there is a large per cent. of carbonic acid or not. This is certainly a very pretty piece of apparatus to look at, and my object is to ascertain whether it has any inherent utility.

On motion of Mr. Slater the thanks of the Association were voted to Mr. Pearson for his paper.

The President—We will now listen to the reading of Mr. Somerville's paper.

DAILY EXPERIENCE AND OBSERVATIONS OF A GAS MANAGER.

By James Somerville.

In complying with the request of the Committee to read a paper before you on the above subject, I am well aware that I can find

nothing that will be new to the majority of you. For my experience, from the nature of things, will be very similar to yours. Therefore, I will only be telling you something which you already know. But, no doubt, the Committee, in asking for such a paper, had in view the younger members of our Association, and that our experience might be of some value to them. I will, therefore, ask that class among us to accompany me on one of my daily walks through the works, and we will relate our experience and make observations as we proceed.

The first place we will visit is the retort house, which is built on the stage principle, and, although the plan is more expensive to build and maintain, yet it has so many advantages, that in the end I consider it to be the best and cheapest; and, no matter how small the works, I would advocate the adoption of this plan. One of its chief benefits is that you have ample space for the large modern gaseous furnace, which, in my opinion, is indispensable to the production of cheap gas; and if, as some of our sanguine friends predict, in a few years we will all be making fuel gas, then, with the two-story retort house, the change to the new order of things can be more easily and cheaply made. You will perceive that the settings are very open, only braced in front and rear, which I have found quite sufficient. This allows ample space and time for the proper combustion of the furnace gases. I should like just here to lay some stress on this element of time in all our operations. My daily observation is that time is an important consideration in the condensing and purification of the gas. Nothing is more injurious to the gas than to suddenly rush it into a lower temperature. It requires time to cool slowly, time to get rid of its tar, time to purify.

You will observe that the heats are good, but not high. I find that there is no advantage in running high heats, that is, heats approaching a white. The gas from such heats is entirely denuded of its light naphthas, and is in a poor condition to stand any change of temperature, but deposits the crystals of naphthaline the first opportunity, which occurs generally before or in the purifiers. I judge of a good heat when the lid is taken off and the retort presents a bright red, sparkling appearance, without a trace of smoke. The coke is curled up at the sides, and comes easily out when the rake is applied to it. I have observed that when the heats are low from any cause there is a corresponding decrease of ammonia; when the heats are good, the strength of the liquor increases. I am not prepared to say just why this should be, but the fact is well established in my mind that the higher the heats the greater is the production of ammonia. It is possible that a greater amount of nitrogen may be taken from the coke during high heats and so cause the increase.

These self-sealing lids are only so in name. They do fairly well for the first year or so. But my experience is that beyond that period they are unable to stand the wear and tear of the retort house. The parts begin to wear out, perfect contact cannot be obtained, their efficiency is ended, and we have to fall back to the old lute. I confess I have given the subject of self-sealing lids much thought, but the difficultics appear to be insurmountable. They must be able to stand all changes of extreme temperature. Their efficiency must not be impaired by the wear and tear of the parts, and they must be able to make a perfectly air-tight joint every time they are shut, notwithstanding that they have to be handled by men who believe only in the existence of muscle.

We now come to what I call the hot scrubber. It is so hot you cannot keep your hand upon it. Here the gas takes a rest as it were, and gets rid of all its heavy tar. You can hear it trickling down between the plates; but the light tars or oily naphthas still flow on with the gas, which is gradually cooled. What tar is left is taken out by the Pelouze & Audouin condenser, which stands next to the ammoniacal liquor scrubber. I am aware that some object to placing the Pelouze at this point in the works, preferring to put it before the exhauster, where I have my hot scrubber. I think they are wrong; for it acts at that point too efficiently, if I may say so. It not only takes out the heavy tar, but the light naphthas also, and puts the gas in the same condition as if the naphthas had been burned up in the retort through extra high heats; and, moreover, the specific gravity of the tar at that point is so high that some will get through the Pelouze, not enough to help the gas any, but enough in the course of time to find its way to the liquor scrubber to seriously impede its efficiency and make it necessary to clean it out once or twice a year. This I never have to do; for no tar finds its way to the liquor scrubber nor into the liquor. This is important when making your own sulphate; for when tar gets into the scrubber it seems to neutralize in some way the action of the water on the gas. I do not use fresh water in the scrubber. I have found it more effectual to use a mild liquor of about two or three-ounce strength. Gas has an aversion to cold water. It is like some gas managers I knew a long time ago—they preferred it mixed.

My experience with purifying material is that, when we used all oxide, it not only absorbed all the impurities, but a large proportion of the hydrocarbons also. I also attributed to its use an increase in the number of meters brought in for repairs. I had, therefore, to discontinue partially its use, and fall back on lime. I find that the center-seal, to perform its work properly, requires to be thoroughly scraped and cleaned once a year. I prefer the open drip, because it can be kept clean, and easily supplied with fresh water. I do not think it is right to pass the purified gas over foul water in the seal.

My observation of the daily working of the holders leads me to this conclusion. Whenever trouble has occurred it can invariably be traced to one source, viz., the weakness of the bottom curb. Let the bottom rollers get out of place, then the stability and safe working of the holder is destroyed. I have had a curious illustration of this fact. We have a holder 130 feet in diameter and only 16 feet in height. Why it was built with these dimensions I cannot tell. It is strongly trussed. The centre of gravity is nearer the top than the bottom, so that a little gale of wind invariably tipped it over. Indeed, I have seen it at right angles; one side jammed into the tank, the other high in the air. This occurred shortly after I took charge of the works. But the workmen were so used to it that it excited in them little surprise. But, as the cost of broken wheels and carriages was excessive, I resolved to see what could be done to make it work more steady. As soon as we got into it, I found, as you anticipate, that every roller was out of place, and the bottem curb badly bent in. I substituted wrought iron for cast wherever it could be done with the rollers, and put a heavy log chain or brace against them on the inside, fastened to the curb, and jammed the rollers tight against the guides. I filled it up again, and no one was more surprised than myself to see how steady the holder has worked ever since, now nearly ten years ago. It has given no trouble and is working every day. There are twelve columns to the holder; but, as for keeping it steady, it might as well be without them. So I think we may conclude from this instance that the safe working of the holders is dependent entirely on the strength of the bottom curb and rollers, constantly tight against the guides.

In my daily photometrical tests I find very little variation. If the specific gravity increases without a corresponding increase in candle power, then it is time to examine the exhauster governor or the self-sealing lids. Much has been said and written lately against the candle as a standard of light. Its imperfections have been dwelt upon with great minuteness. But my experience is that, when the candle is burned under proper conditions, and due corrections made, it does for all practical purposes fairly test the illuminating power of the gas.

I have had some new experience in main laying lately, which may be of some benefit to you should you be fortunate (?) enough to find a supply of natural gas near you. We had ten miles of eight and six inch mains, which were laid by an opposition company, and which we did not need. We agreed to turn them over to a natural gas company for the distribution of their gas. The city ordinance required that they should be laid three feet under the surface, and that they should stand a pressure for one hour of fifteen pounds to the square inch. We had about 1,100 services on these mains, 300 of them only in use. These had all to be cut off, and carefully plugged, for none of them were large enough for natural gas. For the purpose of testing, I cut the main into sections of about 2,000 feet each, and exposed and set up every joint. I then screwed a sensitive diaphragm spring gauge into both ends, and, with a portable steam-boiler, having a Westinghouse air-pump attached to it, pumped the main full of air, until the gauges showed seventeen or eighteen pounds to the square inch. Then the inspector, appointed by the city, went over every joint with soap bubbles, and, with such a pressure on, the smallest leak was easily detected and made sound. If the gauges stood perfectly during the hour at that pressure, the section was accepted. If they showed the slightest drop, it was rejected. But I had very little trouble to get them to stand the test; indeed, many of the joints under the street car-tracks, which it was almost impossible to reach, I had to risk, and, with-

out any setting up, they stood the test. It would happen sometimes during the test that the sun would be clouded, or a shower of rain would come on, which cooled the air in the pipe, and of course contracted it. The gauge would immediately show it, and the inspector would reject the test. It was of no avail that I should try to instill into that functionary's mind something of the science of pneumatics. His orders were that the gauge should stand. If it went up, as would sometimes happen, by the expansion of the air, he would make no objection. I observed during the progress of this work that where the mains had not been properly laid in line, these were the joints that were the most liable to leak.

My experience is that every meter ought to be brought in, examined, repaired (if needful), and tested every five years. All our new meters are tested and stamped with date of test before sending them out. The following table will show you the result of our testing for one year. All the new meters (419) were correct, 56 per cent. of the consumers' meters brought in for testing were correct, 25 per cent. slow, and 19 per cent. fast. The two last columns give the average per cent. of error—8.6 per cent. slow, and 7.3 per cent fast:

List of Consumers' Meters Tested by the Indianapolis Gas Company During the Year.

Months.	No. Tested.	No. Slow.	No. Fast.	No. Correct	% Slow.	% Fast.
January .	18	1	1	16	5	5.5
February .	29	4	10	15	9	6.95
March . .	21	3	5	13	7.33	8.5
April . .	19	5	4	10	8.6	6.37
May . .	15	4	5	6	8.12	6.2
June . .	16	6	3	7	6.33	4.5
July . .	11	3	1	7	16	17.5
August .	10	3	0	7	8	0
September .	10	3	1	6	7.66	5
October .	19	8	2	9	5.42	9.5
November .	19	4	4	11	4.8	3.97
December .	22	9	4	9	13.55	12.25
Totals .	209	53	40	116	ave. % 8.6	ave. % 7.3

"If you wish a thing well done, you must do it yourself," is an old remark, which applies with much force to the supply of gas for cooking and heating purposes. It was not until we took this business into our own hands that we had any success. We have now over 2,000 stoves out and giving great satisfaction, and, strange to say, even with the introduction of natural gas into our city, the sale of stoves has not ceased. I can only understand this from the fact that there is some uncertainty just how long the supply of natural gas will last, and our housekeepers desire to have at least two strings to their bow. I have observed that the main point in fitting up a gas stove is to give it an abundant supply. The pipes should be large, and should come direct from the meter.

We have 600 consumers who pay weekly, most of them at their own desire. Of course this short reckoning entails some extra work; but our aim is, if possible, to meet the wishes of all our customers. I have found it beneficial to both company and consumers to conduct our business as though we had constant, active opposition to contend with.

There are several matters connected with this subject to which I have not alluded. Such as, what my daily experience would lead me to expect and receive from a ton of coal in gas, coke, tar, and sulphate of ammonia—also in the management of men and the maintenance of works, but I am sure the length of this, of necessity, rambling paper has already exhausted your patience.

Discussion.

Mr. King—I confess when I was told the subject assigned to my friend Somerville, I wondered how he was going to take it up, and I now wish to congratulate him on the entire success of his paper. It seems rather difficult, with so much to discuss, to decide just what to take up. There is enough food in the paper to feed us for a long while. It is a good deal like the report of the Executive Committee on the Constitution—it will take a long while to take up each of the questions raised. I started out by marking various passages that interested me, as he was reading; and I find the longest mark made is where he touches on the subject of the holder. It is so much in line with the discussions now going on abroad (brought forward, I believe by Mr. Gadd), on the construction of holders, that it may be interesting to refer to it. It would seem that Mr. Somerville's conclusions are entirely in line with those of Mr. Gadd. He says, for instance, in regard to the construction of the holder, and his means for strengthening it:

"There are twelve columns to the holder; but, as for keeping it steady, it might as well be without them. So I think we may conclude from this instance that the safe working of the holder is dependent entirely on the strength of the bottom curb and rollers, held constantly tight against the guides."

That is a very interesting point to me, and I am glad to hear that the experience of Mr. Somerville confirms what is claimed by Mr. Livesey, Mr. Gadd and others in England. I would like to hear some discussion of that topic.

Mr. Clark—On some points touched by Mr. Somerville my experience does not lead me to agree with him. For instance, I have used self-sealing lids year after year without the trouble which he has experienced. The only care taken with them was to see they were carefully scraped—I do not mean that they were taken off to be scraped, but scraped with a chisel.

Another point is in relation to the position of the hot scrubber. He prefers to put it before the exhauster. Where there is no local obstacle in the way it seems to me the position of the exhauster should be as close to the hydraulic main as it can be got; and that the exhauster should take the gas before it reaches the condenser. The advantages of this arrangement are that the exhauster needs no lubrication, and that then you have a vacuum between the exhauster and the hydraulic main. If you put the P. & A. condenser between the exhauster and hydraulic main, you work on a higher pressure, and you must have .12 vacuum behind your exhauster, which, of course, puts a considerable portion of the apparatus in a vacuum, and, in case of a leak, draws air into the gas. I have never built a hot scrubber, although I have used them, and I think they are very excellent indeed. I have in mind one works, suffering severely from naphthaline, where they put in a hot scrubber, but removed it afterwards. I have an idea that the hot scrubber will go back again before long. My idea is if you can put the exhauster close to the hydraulic main, after the gas passes through the exhauster it should go to the hot scrubber, and then to the P. & A. condenser. I do not think the tar which the P. & A. condenser takes out will have any bad effect upon the gas at the temperature at which it will be taken out, if placed near the hydraulic main. At one time I took the P. & A. condenser, changed its position, and put the exhauster (which had before been after a considerable portion of the condensing apparatus) next to the hydraulic main, and put the P. & A. condenser immediately after it; and the effect was at once an increase in the illuminating power of the gas.

I have remarked Mr. Somerville's experience with oxides; and it is so different from the experience of others, who have spoken of it before this Association, that I was rather struck by it. He says that when he used all oxide, it not only absorbed all the impurities, but a large proportion of the hydro-carbons also. Last year Mr. Blodget read a paper before the Association in which he took directly the opposite position. He claimed that lime purification had a bad effect upon the illuminating power of gas as compared with oxide purification. Mr. McMillin, in the course of the discussion on that paper, stated he had obtained considerable illuminating gas from foul lime. Until now I supposed the statements of Mr. Blodget and Mr. McMillin settled that question, but it would seem that it is still open to experiment and discussion. I believe that those are all the points upon which I differ with Mr. Somerville. The points on which I agree with him are very numerous.

Mr. Mooney—Mr. Somerville says the difficulties attending the use of self-sealing lids appear to be insurmountable. That is a pretty big word. Self-sealing lids are in use in many places, and there are some who scrape the lid every time it is shut—even if there is a pinhole in it it is easier to have luting put on it than to have the men wheeling the lids around and luting them every time they are taken off.

Mr. Scriver—This question of the use of self-sealing lids is a very serious and important one to me at the present time, and I am glad to get all the information on that point that it is possible to obtain. I am very much surprised indeed at the experience of Mr. Somerville. We are putting in at our works at the present time no less than 288 mouthpieces on the regenerative principle; and we are putting in self-sealing lids. I have come to the conclusion that they are the very best lids that can be adopted—after having made a pretty extended tour to England and Scotland last winter I came to that conclusion. They were almost universally used in every gas works that I visited, and were giving first-class satisfaction. I therefore concluded they were the best thing that we could adopt. I am inclined to think Mr. Somerville's retort lids must be of a very inferior kind, because on the other side they were experiencing no trouble at all, and in many cases the lids had been in operation for years. I see that Mr. Somerville is a very progressive man, and that he has gone in for the extensive introduction of gas stoves. He states he has over 2,000 gas stoves out, and that they are giving great satisfaction. His experience is very similar to ours. We went in for gas stoves about 6 years ago, and now have about 2,500 in use. I would like to ask Mr. Somerville if he sells gas for stoves at the same rate as for illuminating purposes.

Mr. Somerville—Yes.

Mr. Scriver—We have adopted another plan—I do not say it is the best one; but I believe it is. We have reduced the price of gas to $1 per thousand for gas stoves, and have found by so doing that we have increased our out-put of gas very materially during the day time, when our retorts would have been comparatively idle. I would also wish to state here, while speaking about gas stoves, we are quite progressive in this line, as we make our own gas stoves, and sell them to the consumers as cheaply as possible and clear ourselves. We give them the advantage of cheap manufacture; and I believe that we have benefited our Company very materially by doing so. I do not know whether Mr. Somerville manufactures his own stoves or not, but we think that is a good thing for us to do so. Whether other gas men think it would be a good thing for them or not, they must decide for themselves.

Mr. Harbison—I have been exceedingly interested in following Mr. Somerville in the reading of his valuable paper.

Eternal vigilance is the price of a high illuminating power and a low price for gas to the consumer, on behalf of gas managers. Our friend Somerville has just led in the front ranks in that behalf. He is the leader; and like faithful followers we will follow right along, trusting to be able to keep him in sight. I quite agree with him in every conclusion he stated. What little experience I have had has led me right along in the same path. I do not see how my friend on my right could have been so misled in his journeyings abroad as to come to the conclusion he has with regard to the use of the self-sealing lids. Luting is good enough for me. And yet he may be right, and I may be wrong. I do not see how on that point we can come to a unanimous verdict. Some have had a very satisfactory experience with self-sealing lids, and some quite the reverse. In making some investigations during the past two or three years on this subject, while considering the question of erecting a new retort house, the item of lids has been a very important one with me. In starting up a new stack of benches ten days ago, to make gas with them for the first time, I used the luted and not the self-sealing lid, because I was not entirely satisfied that there was any one made which would continue to do the work it was intended to do and would be satisfactory to me. Yet, as I say, I may be all wrong about it. I will still try to keep my eyes open and to learn all that I can on the subject. A lid is not a very expensive thing and I hope to get the price of gas down a little lower than now, so that by-and-by I can afford to buy self-sealing lids, if they prove to be beneficial. I do not agree with my friend from Montreal that he is doing the right thing in selling gas for cooking purposes at a reduced rate. He was not quite sure about it himself, although it was satisfactory to them, of making a distinction as to the price of gas to his consumers. If we can afford to reduce our gas to $1 per thousand for domestic purposes, in the shape of fuel, why can we not afford to do it for illumination? The results to him were entirely satisfactory, because he has put out 2,000 stoves, selling gas at $1 per thousand for that specific purpose; but he did not say to us that his company must necessarily have made quite a large investment in order to supply the meters for those 2,000 stoves with which to measure the gas used at $1 per thousand--because the same meter will not measure gas for fuel and for illumination at the same time; therefore, he must duplicate his meters, and that adds largely to the investment. There is no reason why John Smith, who is burning gas at No. 19, should get his gas at $1 per thousand because he is burning it in a stove, while John Jones, at No. 21 shall be required to pay $1.25 because he is using it for light, or for manufacturing purposes. I believe in a uniformity of price, and I believe in having that price so low that everybody can afford to use it for every purpose, and thus largely increase the consumption. Neither do we follow his plan of manufacturing the stoves. We want to give these other fellows a chance. But we buy them as low as we can, and we sell them to the consumer at what they cost us, stating frankly to the consumer that we furnish the best stove we can obtain, at the lowest price for which we can purchase it, and sell it to them at just what it costs us; that so far we are practically a benevolent institution, but that on the amount of gas they burn we make a little profit. By doing this they are perfectly satisfied, and we are happy. I believe it is a good way to serve the public. We do not all agree in all these details. One system may work well in one place and another in another; and it is by stating our experiences in these meetings and comparing them that we get at satisfactory results.

Mr. McMillin—I want to enter a little protest against the abuse of self-sealing lids. I would not think of using any other kind. One-half of the lids in use at our works are self-sealing. The other half is the old lid, that has to be luted each time. While I recognize the fact that the self-sealing lid does wear out, I really do not think it takes half the money to keep them in order that it does to furnish new lids of the luting type. They break and they wear out, and they are taken off by men who burn their fingers, and throw them down, and break them; and they warp, and get out of shape; but I have never yet found any serious objection to the self-sealing lids. The self-sealing lid will leak a little, perhaps; but what if it does? Probably $10 per year would cover the cost of the gas which is lost in that way. I think when we have deep furnaces, and can draw out hot coke directly from the retorts into the furnace, and have self-sealing lids, we have divided into about equal parts the labor of the stokers. They do not have to shovel in any coke or to seal any lids, and so their work is cut down to about one-half what it was in the old way of doing it. I speak on this subject, because the inference might be drawn that our friend Somerville had bad luck because he probably bought his lids from the only establishment manufacturing self-sealing lids in his State—at Fort Wayne. I want to say also that the self-sealing lids which I have had good success with also came from Fort Wayne. I speak of this for fear that some one may draw an incorrect inference.

Mr. Harbison—Will my friend state why, when he is so much in favor of self-sealing lids, one-half of the lids in his retort house are luted?

Mr. McMillin—It is for the reason that they were there when I took charge of the works, and the benches were a little too good to throw away, and the mouthpieces would run a few years longer; but whenever they have had to be renewed, or whenever they will have to be renewed, there will be some other kind of lid put in.

Mr. Somerville—I would like to reply to some of the questions put to me now, first, as to the P. & A. condenser that Mr. Clark spoke about. The reason I came to the conclusion stated was this: I visited a works a few years ago, where the engineer said that they were having trouble with the condenser. I said I thought the condenser was one of the grandest inventions of the age; that it was a splendid thing. He replied: "If you think so much of it you can have it. I do not want it." I inquired in what part of the works he had set it. He told me it was put just before the gas got to the exhauster—between the hydraulic main and the exhauster; that it did not work, did not give any satisfaction, and that he had to take it out. I was just then putting one in at the place where my gas is cooled; and I could not conceive of any nicer machine than a P. & A. condenser for taking out—not exactly the tar, but the oily matter that is left at the condenser, and does not have to be scrubbed at all. I do not think of cleaning out my scrubber. It does not require it. There is no tar in it. No tar gets into the liquor at all. The tar being a little cold at the P. & A. condenser, it requires cleaning oftener than if at the scrubber. I went to another place where the engineer was troubled a good deal with naphthaline in his works; and the P. & A. condener was in that same position again—between the exhauster and the hydraulic. He was very much troubled with naphthaline, and his candle power was not as good as it should have been. The light naphtha seemed to be taken out and there was trouble in the scrubber and from naphthaline. I told him I believed if he changed its position and put the hot scrubber there it would be better. He came to the same conclusion. As to the use of oxide for purification, I have stated my own experience—that the candle power went right down and then went back again. As to the lids, I can only congratulate my friend McMillin that he finds the self-sealing lid works satisfactorily. It is a very serious matter with me. I run a little vacuum on the exhauster all the time, and do not like the candle power to get down for any cause—and I have suffered severely from just that thing--from trying to keep the lids tight. He speaks about the old country. I will say that if I had the machine which most gas works in England have, where they can take the lid off, put it on the scraper, turn it around and smooth it off again, then it would be all right, As we have not got such a machine here, I, therefore, cannot get similar results from the lid. I would like to say that it was not at all the fault of the maker of the lids.

As to gas stoves. At first we made them ourselves, but afterwards we purchased them from manufacturers, who made them better and cheaper than we could.

Mr. Harbison—Does Mr. Somerville consider it essential, in the proper manufacture of gas, to have the P. & A. condenser and hot scrubber; whether those are the only things that can be depended upon? There is no allusion made to anything else, and some of us fear we may have made a great mistake in not putting them in. I do not raise the question by way of disparagement at all, but simply to ask for his opinion.

Mr. Somerville—I do not say they are essential; but I consider them a very good apparatus.

Mr. McMillin—What is the temperature of the gas in the P. & A?

Mr. Somerville—I cannot answer that question. The condenser is so hot that you cannot keep your hand upon it. I think it must be about 120°.

Mr. Harbison—I will say further on this subject, that in adding to our works, as I have been doing in the last two or three years, I have not got any hot scrubber; and the exhauster is as near the hydraulic main as I can conveniently place it. It did not work satisfactorily; and recently I have put in a Walker tar extractor, which thus far has done its work admirably. It is placed just ahead of the Standard scrubber. Of course I have not been working it very long, and do not know just what the result will be, but I find it is doing very nicely now. I might say in this connection that in Hartford, where we charge the same price for gas, whether consumed as fuel or for illumination, we have a little over 1,400 stoves in use, and are selling every one.

Mr. Nettleton—I am sorry to hear Mr. Somerville thinks the difficulties with the self-sealing lid are insurmountable. I have been working at that matter, and trying to get something satisfactory, for a number of years; but so far my experience has been unsatisfactory. Some years ago I saw a lid in one of the large works in New York, that seemed to be perfectly tight. I made a trial of them. They leaked badly, and it was only a few months before they were given up. It turned out that the trouble lay in the difference in size of the mouthpieces—those in New York being 12×20 while mine were 14×25. It is an easy matter to obtain a self-sealing lid which will work well on small mouthpieces, but a difficult matter on large ones—that is, to have the lids as tight as when they are luted. Perhaps I may say in this connection, that I have tried three kinds of lids, and am now trying the fourth. On the other hand; I agree with Mr. McMillin that it is very desirable, if possible, to get rid of the labor of luting lids. I think with him, that by putting the hot coke directly into the furnace, when drawn from the retorts, and also by doing away with the luting of the lids, we can decrease the labor of the stoker nearly one-half. Consequently we can, without calling on him for an unreasonable amount of work, increase our yield of gas per man to twice what it was before. There is no reason why we should not increase from the old standard of 12,000 or 15,000 feet to 25,000 or 30,000 feet, and a good many works are doing it.

Mr. Starr—I did use self-sealing lids, but finally abandoned them. I found that without a great deal of care I would draw in air through the mouthpieces, and so bring down the general average of the gas to about 12 candles. When I went back to the luted lid, I had better gas.

Mr. Floyd—I object to any general condemnation of self-sealing lids, and also to the statement that they cannot be made tight for large as well as small retorts. In fact I know that the results obtained from self-sealing lids, in three or four of the larger cities, where very large retorts and large mouthpieces are used, give fully average results. My observation has shown me that the principal difficulty lies in the treatment of the lids. It is necessary that a lid, which has been turned out in a machine shop, should have different treatment from the ordinary luted lid. It should have a mechanic to look after it. It must be made smooth, and the mouthpiece itself must be straight.

Mr. Ramsdell—We have used self-sealing lids, of two different patents, for the past eight or ten years, and have not experienced any of the difficulties mentioned here. One kind of lid fits into the mouthpiece with a V shape, and the other is one of the kind that is supposed to clean itself. Once in a while a little hardened matter will accumulate on its surface, but it is very easily taken off. It can be easily scraped off with the shovel. Even if there was (as has been suggested here) a slight escape from some part of the lid, it would be a very easy matter to put a little luting on that spot. I think, remembering the cost of maintaining the luting and the labor necessary to keep them, there is no comparison between the two kinds of lids.

Mr. Harbison—I quite agree with the last speaker. If you will only lute the self-sealing lids you will make them tight!

On motion of Mr. Thompson, a vote of thanks was tendered to Mr. Somerville.

In the Matter of Standard Meter Unions.

The President—We will now hear the report of the Committee on Standard Meter Unions.

Mr. Goodwin—In behalf of the Committee I make the following report:

Gentlemen:—Your Committee, appointed at the last meeting of the American Gas Light Association (held in New York), to consider the question of Standard Meter Unions, and to report to the Association at its next meeting, would state, that they held several meetings and carefully considered the question submitted for their consideration. Your Committee find that the subject has required more than ordinary consideration and care, owing to the differences that have been found to exist between the sizes of unions of the several manufacturers, and their desire to prevent any difficulty in the adoption of such standard as might be presented for the Association's consideration. They would report that, to prevent any serious expense or difficulty to the various gas companies in making any changes, that they have agreed upon the following sizes for adoption, viz., 3, 5, and 10 lights, and that this Association be requested to submit the same to its sister Associations for their approval and adoption, and that, should the Association desire that the changes be made in all sizes, the Committee be and is hereby authorized to continue its labors and report fully at the next meeting.

The following are the sizes as recommended:

Size.	Standard Thread.	Diameter.	Tail of swivel.	Nose of swivel.
3 lights.	18	$\frac{63}{64}$ in.	$\frac{44}{64}$ in.	$\frac{42}{64}$ in.
5 "	12	$1\frac{8}{64}$ in.	$\frac{54}{64}$ in.	$\frac{49}{64}$ in.
10 "	$11\frac{1}{2}$	$1\frac{48}{64}$ in.	$1\frac{0}{64}$ in.	1. in.

Respectfully submitted,

W. H. Down, Chairman.

W. W. Goodwin, Secretary.

Mr. White—I move that the report of the Committee be accepted, and that the Committee remain in charge of this matter in order to complete their labors by reporting standard unions for meters of other sizes.

Mr. McMillin—I second that motion.

Mr. Harbison—Before the vote is taken I would like to ask the Chairman or the Committee to kindly state, for the benefit and information of the members of the Association, in what respect, if any, the proposed schedule differs from those now in use, in order that we may understand the report more fully. I do not know that half a dozen men in the room can tell how near the dimensions given for these three sizes agree with those now in use. I, therefore, ask him to state what changes have been made. I am entirely in favor of adopting the report as to the sizes recommended, but I would like to have the Chairman state, for my own advantage as well as that of other members of the Association, what changes have been made from the unions now in use, in the standard adopted.

Mr. Down.—I will state, in answer to Mr. Harbison, that in measuring the different screws we found quite a difference in their diameters, in the number of threads to the inch, and also in the shape and the depth of the thread. We endeavored to reconcile these differences by adopting a standard which should come nearest to the unions most generally in use, and in that way save as much expense as possible to the gas companies, and make the change more easily effected. The threads will be of a standard size, and of the same shape. The changes can be made gradually, and without anybody feeling the expense. Should these sizes be adopted and gas companies state what sizes they want, so that the meter makers will know exactly what to give them, there will be no trouble. I think the greatest change which will be necessary is about 3-64 of an inch. That would be, more particularly, on 3-light meters. We found some threads were 18, 18½, 19 and, in one instance, 20. In adopting the thread at 18 for for 3-lights the change can be made more readily than in any other way, and thus bring about a standard size. Some of the makers will have to go up a trifle, while others will have to come down a trifle in order to make them more readily interchangeable.

Mr. Harbison—I desire to express my gratification at the unanimity of feeling that exists in this matter between the manufacturers of meters. This committee was composed of gentlemen who represented various meter manfacturers and interests in the country; and it is personally gratifying to me—having been somewhat active in the formation of this committee, and the introduction of this matter—to know they have fallen in so heartily with the wishes of the members of this Association, and of the other Associations of the country. Their action will enable us to have a uniform standard meter coupling, so that whether we do business in the West or in the East, whether we buy from one manufacturer or another, the meters we buy will fit our unions, and we will not have as much trouble as there has been in some cities in the attempt to have a meter made by one manufacturer fit a coupling made by another. I think the gentlemen engaged in this industry deserve our sincere thanks for their efforts, and for so readily acting in conformity to the wishes of the Association. Their interests are ours and ours are theirs. I like to see this friendly feeling existing among them, and to know that they have come up so promptly in response to the wishes of the Association in respect to adopting standard unions, and have agreed among themselves to make such changes as are necessary, and to go to such expense as is required, and t so manage their business as to best suit the wishes of their customers. I hope the report of the committee will be accepted and adopted, and that the committee by another year will have completed their labors, and given uniform standards with reference to all sizes.

Mr. Goodwin—While there seems to be a very condsiderable difference in sizes, as you hear them mentioned, still, when you come to deal with the figures that we are dealing with there is not so much difference as there would seem to be. For instance, four of the manufacturers make the diameter of the thread $\frac{63}{64}$, and two of them $\frac{62}{64}$; and the recommendation is that the standard thread shall be $\frac{63}{64}$. So you see that there is not so much difference after all. What the committee propose to do, if we are continued, is to get up a set of steel standards, at our own expense, to present to the Association, and these will thereafter be known as the standards of all meter manufacturers.

Mr. Down—Gentlemen probably do not recognize what difference the sixty-fourth of an inch will make in the diameter of a screw. It is enough of a difference to bother anybody in attempting to make the coupling. It is a much greater difference than we want. As Mr. Goodwin says it is the desire of the committee, if these standards are adopted, to make steel standards and place them in charge of the American Gas Light Association, to be known as standard gauges for all unions, to which all meter makers will have access at any time they require to test the gauges in order to keep them in proper condition.

Mr. McDonald—I feel that this matter has been very carefully handled by the committee. The greatest difficulty we anticipated was that the gas companies would be put to trouble if these changes were made, and, therefore, it was desirous that we should know whether the gas companies, and those representing them, would accept these standards. It is easy for any meter manufacturer to make standard sizes, if we know what the sizes are. The changes are not wholly on the thread, or the size of the thread, but on the size of the tail piece. There has been more change in that than in the actual size of the screw. Considerable complaint is sometimes made because one manufacturer's tail piece or lining will not go into the ring of another. We had to make material changes in those respects; and we will have to ask from the people who are using the unions some consideration in this respect. I say this the more freely because I do not think it bears on one maufacturer more than it does on another, as no two of them were exactly alike; but the manufacturers have tried to arrange sizes of standards in such a way that the changes will be as slight as possible. Still there will be changes which will make difficulties, if those standard sizes are used with some of the old ones.

Mr. Young—I think it is very important they should be so made as to go into the couplings of the old meters.

Mr. McDonald—There will be no trouble about that point. That will be taken care of.

Mr. A. C. Humphreys—If this motion to recommit should pass, will the standards as adopted go into use at once, or will the whole subject wait until next year? Furthermore, I would like to ask if the Committee have made provision for stamping or designating their standard unions, so that we will know just what we are getting. There should be something to designate that it is the new union. That would be a great convenience to the men who are actually handling the work.

Mr. Down—That can be done so that there should be no mistake made. It can be designated in several ways. It can be done by making a difference in the shape of the union, or by simply stamping with an "S."

Mr. Harbison—I would suggest to the manufacturers, who are present and who have spoken, that they designate their standard union with the letter "S," and that this be done uniformly so that all the makers and gas men will understand it. My understanding of this report, and of the motion to adopt it, and to continue the committee, is that the union recommended for three, five and ten lights, shall go into use at once. That is my understanding of it, and I wish that the Chair in stating the question would be kind

enough to so state it. Let it be the understanding of the Association that the agreement of the meter manufacturers, through their committee, is that the standard sizes for three, five and ten lights are now to be made, and stamped with the letter "S," so that we may all know them.

Mr. Down—In answer to Mr Harbison I will say that it is impossible to do this immediately, as it will take some little time to make the necessary changes; but the meter men are a very liberal sort of people, and although they do not care to make changes if it is possible to avoid doing so, still they are quite willing to meet the wishes of the Association in this regard, and to do so as promptly as possible. I will say, for my confreres and for myself, that the standards will be put in such a shape, or so designated, that there need be no mistake made in taking them. Perhaps soon after the first of January we can get the thing in working shape.

Mr. Griffin—This report asks you to submit the matter to the other gas Associations for their approval and adoption, and if they adopt it, then we can all go into it. In the meantime we will all get down as close as we can, so that by the time it is adopted by the other Associations we will all be ready to adopt the standard.

Mr. McMillin—I think the suggestion of Mr. Harbison is in the right line, that if this is a good thing it should be adopted at once, and without waiting for another year. All the sister Associations are represented here—I believe I belong to all of them myself; and there are many others here who belong to the other Associations. There is, therefore, no necessity for awaiting their endorsement of what we do, because they will have to indorse it any way. I congratulate myself, and the Association that the meter men have been so unanimous in working this standard union up. My friend Harbison takes great pleasure to himself in having been a sort of instigator of this matter; but I think he has really planned better than he knew.

Mr. Goodwin—The Committee thought they had better not proceed further than with those first three sizes until they obtained the sense of the Association; but as it appears to be the sense of Association that we shall proceed at once with the manufacture of those three sizes as suggested, I would ask, in behalf of the parties in interest, that you name a period of three or four months from the present time, for the reason that we have to make some material changes; and it would take some time to do it. If you name three or four months hence, we will be able to comply with your wishes, say, by the first of Jannary or February, 1889. I ask you to say that on and after the first of March all unions shall be stamped in that way. It will put us to considerable expense to get these standards up, and we want everything done to the satisfaction of the Association; and as each meter establishment will require a set of the standards, it will be no small job to make them all and be sure of their accuracy.

Mr. Somerville—I would like to ask this question: Suppose that standard unions are adopted and we send out new meters to be set—of course the old connections are at the consumers'—what will be the result? Will these old connections fit the new meters; or will we have to put on new connections?

Mr. Down—As you all know, we sometimes find difficulty in making the connections the way they are now. I was always taught to make the connection so that the flange of the lining would set down fair and square on the union, and if I could not make the connection in that way I had not done my work correctly. If made in that way there will be no difficulty; but if you have to use a winch to pull the connection over, you will experience some difficulty.

Mr. Somerville—I am very glad that the committee have taken this matter up, because it has happened once or twice that I have sent my men out a distance, perhaps of two miles, to set a meter, but when they had got there they found the connections did not fit. It has not occurred very often; but it has been exasperating when it has happened.

Mr. Down—We have made the sizes so that they would fit, as near as possible, the greatest number of unions; but to say that there will be no difficulty whatever experienced would be absurd, because there will be some difficulty. The managers of gas works will have to recognize that fact, and must be willing to share a little of the burden.

Mr. Harbison—I move that the recommendation of the committee with regard to the size of standard thread for three, five and ten lights, be accepted, to take effect the first of March; and that the committee be continued and requested to designate other standard sizes. (Carried.)

The motion prevailed.

Mr. Frederick Mayer, of Baltimore, Md., then read the following paper, entitled

CONSTRUCTION OF GASHOLDERS WITH WROUGHT IRON OR STEEL TANKS ABOVE GROUND.

It has been the desire and aim of gas engineers in all modern constructions of magnitude and importance to provide an easy access to all parts of an apparatus, even to the gas main and its drips, as far as they are located in the works. The advantages of this sytem are apparent.

In a works where all the apparatus are constructed above ground, surrounded by plenty of air and light, it is an easy matter for the engineer to control the condition of the apparatus and maintain it in a proper state.

Little or no attention in this direction has been paid in this country to the construction of gasholder tanks, although they form a part of the most expensive apparatus which enter into the construction of a gas works.

It has been the custom to repeat the old and well-known construction of brick tanks in almost every instance where a new gasholder was erected, although it is well known that the guarantees for perfectness of construction and proper results are exceedingly doubtful, even in good building ground. Numerous instances of defective brick tanks prove the correctness of this assertion. For this reason it seems to me very necessary to look forward to a construction of gasholder tanks which will overcome the above objections.

With this view I have proposed and advocated during the last three years the construction of wrought iron or steel tanks built above ground; and have designed and erected several holder tanks from which I have obtained results that appear to me to give the advantages which I hereafter enumerate and present for your consideration, and trust that they may prove of some assistance in enabling you to determine whether or not the adaptability of iron or steel gas holder tanks, constructed above ground, is advantageous.

The advantages of wrought-iron or steel tanks as compared with brick tanks are:—

(1) Reduced cost of construction; (2), less time required in their construction; (3), positive assurance of perfect construction; (4), accessibility to all parts of the tank and inlet and outlet pipes; (5), no deterioration of ground.

It is very difficult to estimate the probable cost of a brick tank previous to its construction, when the same is to be executed in treacherous ground; whereas the cost of a proper foundation to support the iron tank is comparatively easily determined and provided for, as even in iron tanks of 35 feet in depth the load per square foot only amounts to 2,200 pounds, which is not an unusual pressure upon foundations.

In very bad ground, piling becomes necessary, and, according to its formation, either wood, sand, or concrete piles must be applied.

The character of such piling is readily determined if an iron construction is to be used; but proper tests to determine what is required for a brick construction can only with difficulty be obtained, owing to the increased depth. In consequence of the unreliability of these tests, it frequently becomes necessary to resort to piling after the excavations for tank have been made; and in such cases where piling was not contemplated, as well as in others where water and quicksand become factors to be dealt with, large expense is incurred in providing steam boilers and pumps, and keeping them in operation during the progress of construction. This expense is not infrequently supplemented by the necessity of sheet piling: with the added expense is coupled the delay of completion; and many engineers, who have been confronted with these obstacles have been compelled to spend double the time originally counted upon in the construction of the gasholder tank, and during this time could not avail themselves of the probably much needed additional storage capacity.

The time of completion for the construction of an iron tank of average dimensions can, with certainty, be established to within a week or two, and in large tanks to within two or three weeks; and when compared with the time required to construct a brick tank, under the most favorable conditions, in good building ground, can be accomplished in from 20 to 30 per cent. less time than that required for the brick tank.

It is the opinion of many engineers that a brick tank of large dimensions should be constructed the year previous to the holder. This has no doubt many advantages, but again adds to the cost of construction, on account of the necessary protection against frost and deterioration during the winter months; the ordinary protection during this time being the filling of the tank with water, which of course has to be pumped out previous to the construction of the holder.

When properly constructed and carefully executed, it is reasonably to be expected that iron tanks will have the desired results as to perfectness; but this cannot be asserted of the brick tank, as often its defects are not developed until the same is being filled with water, when, in many instances, apparently good and sound tanks show a large amount of leakage.

There are many causes which may render a brick tank defective before the holder is completed. Where much water is encountered and pumping has to be continued after the tank is completed, to admit of the erection of the iron work, it is possible that the backfilling on the exterior of the tank wall near its base is undermined, thus forming a receptacle for the water that penetrates the brick work at this point, and is no doubt, in many instances, the cause of leaks that appear to be unaccountable. As the exterior of the tank is not accessible, the most careful examination of the interior of same would not detect the defect. These conditions do not exist in the construction of iron tanks; and should any defects be developed in the latter, they are at once observable and easily remedied.

The claim that the erection of an iron tank does not deteriorate the ground is of course only of importance under peculiar conditions. In our large and rapidly growing cities, where ground in favorable locations increases in value with the growth of the population, a lot of ground occupied by a brick gasholder tank remains comparatively valueless, as it is not applicable for anything else but a gasholder; but iron tanks are susceptible of being taken apart and reconstructed in different locations, thus admitting of the disposal of the original site upon advantageous conditions.

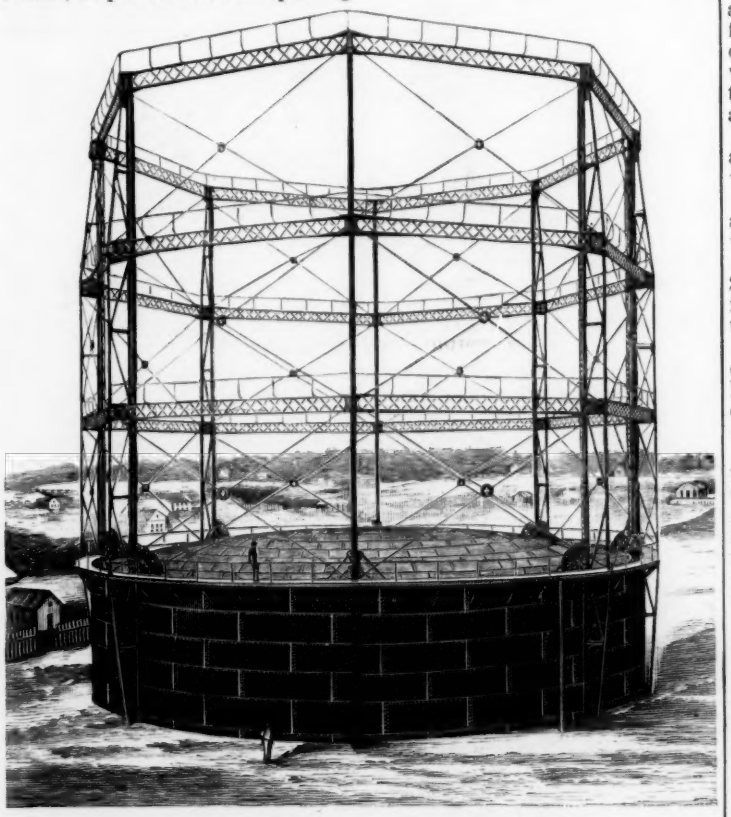
The gradual development and progress in the construction of wrought iron tanks is clearly shown by the exhibited plans and photographs. The appearance of the guide-frame shown upon these drawings especially for three-lift holders, will probably raise the question, at the first sight, if the latter is sufficiently strong in all its parts.

Fortunately, the engineer is not forced to construct from personal perception, but from measure of numerical values; which are applicable, with entire safety, for the resisting capacity of the materials that enter into the construction of the guide-framing.

My first construction was a tank 22 ft. 6 in. in diameter by 11 ft. 0 in. deep, erected in 1885 for the Equitable Gas Light Company, of New York city. The standards of the guide-frame were supported directly upon the concrete foundations below tank. This idea was abandoned in the construction of the second tank at Lynn, Mass., in 1886, where the entire weight of guide-framing is supported by the side plating of tank. In all later constructions the idea of supporting the entire weight of guide-framing upon side plating of tank was maintained.

The bottoms of tanks are all perfectly horizontal, and must be solidly embedded upon the foundations with cement grouting. The latter is poured under the bottom, after the same is in position, through hand-holes constructed for this purpose on the inner surface of bottom.

The strains imposed upon the iron work of tank by internal pressure, are, for the shell, directly proportional to the diameter of same, and in the construction shown do not exceed in any part of the riveted joints 10,700 lbs. per square inch, and the strength of riveting, as compared with the plating, is, for the lower vertical triple riveted seams, 81 per cent., for the upper double riveted seams, 76 per cent. of the plating.



The required strength at the upper edge of tank is obtained through a horizontal continuous circular girder of plate iron.

The supports for standards of guide-frame consist of large brackets extending through the entire depth of tank, constructed of angle and bar iron of suitable dimensions.

After the standards have been attached to the brackets they form a part of them, and through them the entire weight of guide-frame is uniformly distributed through the side plating of tank and its foundation. By these means the pressure from the weight of guide-framing upon the foundation is not only uniformly distributed, but is also reduced to the minimum per unit of surface.

The overflow near the upper edge of tank is provided with two outlets at different levels, so that the water-line can be lowered when necessary to admit painting the inner and upper surfaces of tank to prevent oxidation at this point. In large tanks it is very necessary to make provision for expansion and contraction.

The guide-framing consists of wrought iron trussed standards composed of shape and bar iron, solidly riveted together, and connected at each other and to the tank by wrought iron latticed girders provided with polygonal braces of plate iron, and diagonal braces of bar iron. Through the polygonal and diagonal bracing the entire structure is so secured that the strains imposed upon the same by wind pressure are transferred to the continuous circular girder surrounding the upper edge of tank and to the side plating of same.

A careful static calculation of the strains in the guide-framing has resulted in a construction light in appearance as compared with the usual arrangement of guide-framing, and yet one possessing greater resistance to the heaviest wind pressures than the ordinary construction, especially where the columns are connected to the masonry of brick tanks.

I received a practical proof of the correctness of this construction from a test of a triple-lift holder and iron tank recently erected in Memphis, dimensions 100 ft. 0 in. in diameter by 100 ft. 0 in. high. When the holder was being tested and was inflated to its full height, it was caught in a tornado, in which the wind reached a velocity of seventy miles per hour, passing through the ordeal without the slightest damage, although buildings in the immediate neighborhood were demolished, trees uprooted, etc.

With the construction of iron tanks it becomes an important question how to prevent the formation of ice. If sufficient steam can be spared from an already existing boiler, this system of heating the water should be applied; but where an additional apparatus is required for this purpose, the system of heating by hot water has the preference.

I have no practical data at present as to the heating surface required in proportion to the volume of tank, but shall be glad to lay before you during our next meeting the results of my experience in this direction during the coming season.

A system of heating the tank by hot water circulation deserves probably the preference on account of the little attention necessary, as only the fuel supply to the boiler demands the latter. With either the low-pressure steam or hot water systems it is required that the heating surface is uniformly distributed around the inner circumference of tank. A circulating pipe near the inner circumference of tank, entering the same immediately above the bottom and leaving the same at an adjacent point, is all that is required for tanks of ordinary dimensions. For larger tanks, two or three circulating coils must be applied; and if each of them is provided with proper valves, the amount of heating surface and consumption of fuel can be proportioned to the temperature of the atmosphere.

There have been erected under my supervision single, double, and triple-lift gasholders with wrought iron tanks above ground, varying in capacity from 3,000 to 500,000 cubic feet.

The two triple-lift holders constructed at Memphis and New York are probably of special interest on account of their large dimensions, which are as follows:—

Memphis: Erected in 1887; inner section 93 ft. 6 in. diameter by 24 ft. 4 in. high; middle section, 95 ft. 0 in. in diameter by 24 ft. 4 in. high; outer section 96 ft. 6 in. in diameter by 23 ft. 4 in. high; tank, 99 ft. 0 in. in diameter by 25 ft. 4 in. deep. (See illustration.)

New York: Erected during the present season and about to be completed; inner section, 85 ft. 9 in. in diameter by 28 ft. 4 in. high; middle section, 87 ft. 3 in. in diameter by 28 ft. 4 in. high; outer section, 88 ft. 9 in. in diameter by 27 ft. 4 in. high; tank, 91 ft. 6 in. in diameter by 29 ft. 4 in. deep.

In the construction of these holders particular attention was paid to the arrangement of guide rollers and carriages. For the rollers the combined systems of radial and tangential rollers were applied. All the carriages are constructed entirely of wrought iron under recently obtained patents. The carriages are so arranged that by their application all strains imposed upon the channel bars of the cups by the weight of the different sections are eliminated and transferred directly to the vertical stiffeners of the same.

The numerous recent executions of gasholders with wrought iron tanks above ground apparently prove the correctness of the often heard assertion, "that the majority of brick tanks are defective."

During the present year the excavation for a brick gasholder tank in the city of New York, for the Standard Gas Light Company, has progressed to nearly one-third of its intended depth, when it became exceedingly doubtful if the continuation of the excavation and erection of the brick tank would warrant the desired results.

After carefully considering the condition, the Gas Company decided to abandon the construction of the brick and substitute the iron tank.

It is apparent that if the iron tank is suitable to replace a brick tank under extremely unfavorable conditions, it is much more able to do so under favorable conditions, when the cost of the foundations for the same is reduced to the minimum.

Discussion.

Mr. Smedberg—In 1868 I had a tank split through about one-third of its outer length, and up the sides to the top. We repaired it by cutting out, and repatching with brick and Portland cement. If we had had an iron tank there I am certain that it would not have happened; for I think that an iron tank, constructed according to Mr. Mayer's ideas, would have stood the strain of the shock. I have no doubt President Turner will agree with me in regard to that point.

Mr. Harbison—I doubt whether there are many men in this room who have not had more or less experience with leaky tanks. There may occasionally be a man who has had the good fortune to build his tanks on such ground or rock that the foundation has not given away; but I think not many of us can make that boast. If we can have tanks constructed in a manner somewhat after Mr. Mayer's description and plan, I think it will be a great step in advance of our experience up to this time. I know that it would be a very great advantage to me if my tanks were all as tight as I think that these iron or steel tanks can be made. I am unfortunately (or

otherwise) located where there is a rise and fall of 27 feet in the water level, and hence the ground is made ground, so-called. I have had a good deal of difficulty with tanks. I have 4 tanks—one 60 feet in diameter, one 75 feet, and two are 90 feet or more. In two of those tanks I have already put in a lining of four-inch brick wall on the inside, and, of course, have lessened the space that it is desirable to have between the inside of the tank wall and the outer side. One tank that is now leaking (it is 94 feet in diameter and 24 feet deep) has caused me to consider the question of putting in an iron or steel lining instead of a brick one; it is split from top to bottom, having been built on made ground, and up to this time I have not been able to make it tight. I think if I were going to build a new one I would be very strongly disposed to try this innovation, as we may call it, which has been recommended. I think it is a practical solution of the difficulty, which is encountered in the construction of brick tanks, in the effort to make our tanks perfectly tight. I do not apprehend that the difficulty of keeping it free from ice would be much greater than with the brick tank, according to the plans suggested by Mr. Mayer. I suppose it would not be a practical difficulty to house the holder and tank together, when the difficulty from frost would either be practically obviated or greatly reduced. It would not be a particularly expensive matter to cover the whole tank, in addition to covering the holder built in a brick tank. I think that this is a step in the right direction.

Mr. Somerville—As Mr. Harbison says, this is something quite new—at any rate it is new to me; for I had no idea that they were making gasholder tanks of wrought iron. It puts me in mind of the old days when we used cast iron tanks. Our cast iron tanks I can understand; but I do not think we would have ever thought of putting wrought iron tanks upon the ground. It does not hurt a cast iron tank to rust; there is no oxidation at all—you can put a piece of cast iron in the ground and it is as good as ever when taken out, no matter how long it has been there; but we know that that is not the case with wrought iron, for oxidation commences immediately if the air gets to it. I would like to ask Mr. Mayer what is to prevent the bottom of the tank from rusting, and how does he know when it is rusting? I think, too, there would be some difficulty in keeping such a tank from freezing. Another question I would like to ask him is, what pressure would be upon that holder, 100 feet in diameter and 100 feet high?

Mr. A. C. Humphreys—I am glad to hear a paper read on this subject, and especially glad to hear it presented by a gentleman so well able to do it justice. There is no question in my mind but there is something in the construction of wrought iron tanks. I fully agree with everything that Mr. Mayer said with regard to the trouble that we have with broken tanks; and I do not think that any of us are warranted in putting a dollar in a brick tank if we have even a doubt about the foundation. We put up a couple of small wrought iron tanks three years ago, and they have never given us a day's trouble since. As to the advantages claimed for wrought iron or steel tanks, as compared with brick tanks, as stated by Mr. Mayer, I think I can personally agree with three of them. It certainly reduces the cost of construction; less time is required in construction; and there is positive assurance of perfect construction, or, at least, there is every chance of getting what we call perfect construction. We also have accessibility to all parts of the tank. Of course it does not give us accessibility to the bottom of the tank; but I think that that can be perfectly provided for by the first setting of the tank. The method that Mr. Mayer has suggested is new to me; but I think that it would fully cover the difficulty. Of course, setting in concrete is not new; but the method of getting at every part through a small hand-hole, which can afterwards be made good, seems to be satisfactory. I think there will be no difficulty in 50 years from rust, under that construction. We have seen what can be done in this way by oil tank constructors. They throw it right down on the ground; practically, right in the mud; but I think if you will take up those tanks and examine them, as long as they are painted where they are exposed, you will find no trouble with them from year to year. I have made that suggestion to some of the oil men and they have been surprised at it. The men I have talked with have never given it a thought. There is one point in regard to starting brick construction a year ahead which is important. I do not think that Mr. Mayer put that as strongly as he might. In such a case we have to add interest on the cost of the ground and of the tank, which, of course, we do not have to do in the case of the wrought iron tank. The greatest trouble that I anticipate from the use of these tanks is from the frost. As Mr. Mayer has pointed out, we may provide for it in many ways; the trouble is with the cost of doing it. There will be that standing objection to it as compared with a brick tank. It will radiate more rapidly than a brick tank will do.

Mr. Mayer—Mr. Humphreys has answered Mr. Somerville's first question. As to the oxidation on the under side, I do not think it is of any consequence. I believe that the oxidation on the inside of the tank, where it is covered with water, will only penetrate to a certain thickness; and the outside can be made perfectly free from oxidation by painting it. The outside is exposed to examination at all times.

Mr. Page—It was my pleasure to inspect the largest of these holders, and I was certainly impressed with the great importance of this marked improvement in the construction of gasholders. It is doubtless known to most of the Association that this mode of construction has already been adopted to a considerable extent in England; and at the recent meeting of the Gas Institute it was believed it would gradually supersede the previous manner of building gasholder tanks. It was not adopted, however, in the contruction of that marvelous gasholder at East Greenwich, which is 280 feet in diameter, nearly 200 feet high, and holding 8½ millions cubic feet. Neither has it been adopted in the construction of the two next largest holders—at Birmingham—which were erected at the same time, and which hold 6½ millions cubic feet each. The suggestion as to these increased sizes and dimensions of gasholders is important, because it is doubtless the tendency here (as shown in the great holder just completed in Chicago, holding 3½ millions cubic feet, and the one built in New York, of about the same capacity), to believe that the greater the size of the holder the less is the percentage of cost. The point made that the ground taken by holders is most often taken at points where the land is expensive, has an important bearing. Another interesting point in the discussion which may be alluded to is as to the cost of this improved mode of building holders. The general impression, so far as I had opportunity of speaking with English engineers, was that the cheaper method, the stronger method and the far less expensive method (dispensing with columns) would speedily prevail; and, as has been stated, this is one of the largest and most extensive expenditures of a gas company. That fact is of deep interest, in view of the largely increased capital account rendered necessary by improvements of this nature.

Mr. Somerville - Of what thicknesses are the plates?

Mr. Mayer—In the Memphis holder the bottom plates are, I think, 11-16ths or ¾ of an inch; in the New York example the bottom plates are ⅞ of an inch.

Mr. Somerville—What is the size?

Mr. Mayer—Practically about four feet wide by 16 feet in length. Of course they are reduced in size as they grow up. As the pressure is reduced the thickness of the plates is reduced proportionately. They are triply riveted for the bottom and doubly riveted for the upper seams.

The President—I think Mr. Corbett might give us some interesting information on this subject.

Mr. Corbett—I believe Mr. Mayer has filled the bill pretty well. I do not know that I have anything to add, excepting that the wrought iron tanks have been built for quite a number of years—even longer than he states.

Mr. Nettleton—I would like to ask Mr. Mayer whether it is a well understood fact that iron under water is merely covered with oxide, and then stops rusting. Is that so beyond all question?

Mr. Mayer—Yes.

On motion of Mr. Corbett, the thanks of the Association were voted to Mr. Mayer.

Mr. D. H. Geggie, of Quebec, read his paper on—

EXPERIENCE IN DISTRIBUTING GAS UNDER EXTREMELY LOW TEMPERATURES.

Mr. President and Gentlemen: In presenting to the Association the paper which the Executive Committee allotted me, I have no expectation that you will hear anything new or novel; so I will not encroach much upon your time, as there are papers of more importance to be read by other gentlemen.

The title of my paper I think should have been the "Difficulties of Distributing Gas Under Low Temperatures," as the situation of Quebec is so far north, and the winters so long and severe. The temperature from the first of November to the first of April averages 15° F., and for at least two months of that time it is below zero, and frequently reaches 36° below.

Before proceeding with the subject under review, a short description of a portion of our apparatus may not be out of place.

After the gas passes through the air condenser, it enters into a St. John & Rockwell scrubber condenser, where it is washed by the liquor from the hydraulic main, and the volume of gas is divided many hundred times by mesh-work, and all traces of tar completely arrested. The gas then enters a series of upright pipes, which are provided with a lattice-work of corrugated plates, and then makes its exit to the Standard washer.

I find this apparatus not only eliminates the tar, but will never permit naphthaline to be deposited about the works, inlets to the gasholders, or carried to the street mains and services. In fact, I have never experienced the trouble naphthaline gives to so many gas engineers when there is a sudden change in the temperature.

The candle power of the gas in winter, tested by our Government Inspector, at his office about half a mile from the works, averages 17½ to 18 candles, using Newcastle and Provincial coals, with 4 per cent. of cannel; and I attribute the small percentage of enricher required to the effective manner in which the St. John & Rockwell apparatus breaks up and adds the vapors of benzole to the gas.

The gasholders are all in brick and stone buildings heated by steam, entailing a heavy cost on capital; but owing to the severe frost and snow storms it would be impossible to work them if they were not protected from the weather.

The distributing plant of the works which I manage consists of three leading mains from the holder houses to the three principal districts of the city, each of these mains, with their valves and governors, being subdivided into several smaller districts by valves. This has been carried out so that, in case of a break in the mains or a fire, the district in which it occurs can be shut off without interfering with any other portion of the distributing system. Gas engineers generally are well aware of the importance of districting mains; and I would urge every one present who has not done so to try it, as it is an easy method of locating leakage on the mains and services.

As it is a well-known law that for every 5° of cold gas decreases

in volume about 1 per cent., and *vice versa*, the gas which leaves our holder in winter at an average temperature of 55°, having to pass through the mains to a great extent embedded in frost, reduces the quantity about 5 per cent., thus increasing the unaccounted-for gas.

Our street mains are all laid from four to six feet deep on one or both sides of the streets, near the curb line; and in wet ground in the lower portions of the city, and also in the upper part where there is a great deal of rock which conveys frost readily, we have placed many of our mains and service pipes in wooden boxes with tar and sawdust.

A diversity of opinion exists as to the best form of joint to adopt; but in my experience, although we have both the lead and turned and bored, I prefer the former, as it is more elastic and is less liable to fracture by frost, contraction or subsidence of the ground. I now use lead joints altogether, as I find when the frost penetrates below the pipes it is invariably the body of a turned and bored pipe that breaks, owing to the rigid nature of the joint, and we have several broken every winter, causing a heavy leakage and expense digging through the frozen ground to make repairs.

As in many other cities, the water and drainage pipes were laid subsequent to the gas pipes; the city authorities, taking advantage of cheap labor in winter, frequently open streets to lay their pipes and services, and as these pipes are all laid about eight feet deep, our mains and services are often uncovered, exposing them to frost, and entailing the use of large quantities of spirits to thaw them.

During the severe weather last winter, about 1,000 water mains and services were frozen and burst in the city, and at least 200 trenches were made in the streets to repair them. As the earth is all frozen when these trenches are filled, the greatest trouble occurs in the spring, when our pipes bag, fill with water and often break, owing to the subsidence of the ground.

In extremely cold weather the service pipes easily deliver the necessary quantity of gas; but whenever the temperature gets warmer, frost forms rapidly in many of them, close to the walls of the houses, and shuts off the supply. For these stoppages, I place on the leading pipe from the service a funnel and cock, into which spirits are poured to cut the frost.

It is unnecessary for me to say anything about the difficulties experienced in keeping the lamp services clear of frost, as our streets at present are all lighted by the arc light, and the details would probably be a repetition of the experience of the majority of the members present.

Discussion.

Mr. Robert Baxter—This is a subject which of course does not directly interest a majority of the members; but as I happen to be a native of the frigid zone, though my city is not quite so cold as Mr. Geggie's place, I think a word or two on this subject may not be unacceptable. In Halifax the temperature does not fall so low as it does in Quebec—we may have it down once or twice during the winter to 16 degrees below zero, but it is only for a day or so, although the frost there will sometimes reach a depth of eight feet. Our experience generally has been pretty much the same as his at Quebec. I think that Quebec, from what I know of the place, is peculiarly well adapted for districting, while Halifax is not so well adapted for districting; but I presume it is, in this respect, on a par with many other towns in Canada and the United States. Our streets run the whole length of the town, and are cross cut, and it would be an extremely difficult matter to district it, however advantageous it might be to do so. Our street mains are laid from four to five feet deep, but sometimes we find that the frost gets down under them. We do not often find that the turned and bored joints break. We use them altogether, and rarely have a broken joint. The trouble with the breakages in our mains, and especially with the service pipes, is caused by the people laying drains and not filling the ground up properly underneath. As a rule we pack the pipes underneath with stone on the ground, so that the downward pressure is equalized as much as possible. We have a large number of pipe broken in winter from that cause, and we find what, of course, is a natural result, that the breakage of the pipe is wider at the bottom than at the top, showing that the action of the frost is a downward pressure. Of course you know when anything freezes it expands; and after the surface of the ground is frozen, and the frost gradually descends, it cannot raise the cake of frost above it, and, therefore, the pressure is downward. We often find the upper part of the pipe perfectly closed while it is open underneath. As the ground is removed for some little distance in order to make the repairs, it generally springs up again to its proper position and straightens itself out. We have another difficulty in distributing the gas in those temperatures, and that is with regard to meters. We use wet meters almost entirely, and set them in a place where they will not freeze. We use methylated spirits in the proportion of two to one. While that is a little troublesome because of the evaporation of the liquid, we find it very useful. We did use glycerine, and are about to try it again. As a correct measuring instrument, we consider the wet meters better than the dry, taken as a whole. The registration is more to be depended upon. We have this advantage over the ordinary cold wet meter in that we have them all fitted with a reserved fountain. In a three-light meter we have a reserve supply of 3½ to 4½ pounds of water, and in a ten-light the reserve supply is 16 pounds of water. That gives us an excellent meter of unvarying correctness.

With regard to the stoppage of pipes. We supplied the railway department with a three-inch service pipe. They built a grain-elevator right over the pipe, and changed the position of the pipe in the basement of the elevator so as to pass one of the bins—it was in the winter time, and we had a stoppage of the gas supply. We cut the pipe just after it came through the wall, or at least where the bend came to one side, and changed its direction, and we found that it was packed full of hoar frost. We could shove in our fingers and pull it out. That never occurred there before, and it proved to us, what we had a faint idea of before, that there was a deposition of hoar frost in parts where a constant change of temperature comes, as from a comparatively warm ground to a cold ground, or where a cold draught is passing through. It gave us a good deal of trouble until the building was thoroughly finished, and then the trouble ceased.

Mr. Scriver—I happen to be one of the unfortunate fellows who live in a cold country. Coming from Montreal, I am not very much farther south than our friend Mr. Geggie, and yet I am far enough south to experience a little milder weather. I do not know that we get down to 36 degrees below zero there, but we very often have it at zero, which is quite cold enough to be comfortable. We have a great deal of trouble, as you have heard, from the extremely cold weather of our northern climate; but the greatest trouble which we experience is the trouble with capital. We require at least double the capital to construct gas works in Montreal, Quebec, or Halifax that you need in New York, Brooklyn, Washington or any point about there. We have to put our pipes down to a very great depth in the ground. We lay our pipes with a covering of at least five feet, and find it is not safe to have them any nearer the surface than that. We have to construct over all our machinery very expensive buildings. I wish we could run our gasholders in the open air, as they are represented in the pictures which are exhibited here; but we cannot do so, and we have to put up very expensive buildings, with costly iron roofs over them. We have to cover in our purifiers and condensers—in fact, all the machinery has to be thoroughly housed. We have not only to keep them covered with buildings, but we have also the additional expense of keeping them warm, to prevent them from freezing. It would not do for us to allow the gasholder to freeze; and, therefore, we have to keep an immense space heated. With regard to the freezing of pipes I may state that in Montreal we have on more than one occasion found our pipes frozen solid for at least 100 feet. Then, with the temperature below zero, we have to open the ground, expose the pipes, and thaw them out. The only way to get the frost out of the pipes under such circumstances is to build coke fires upon them; and it is rather a strange sight in the middle of winter to see about 100 feet of ground open, filled with hot coke, burning away night and day for three or four days, until the frost is removed. Another difficulty with which we have to contend is that bugbear naphthaline. The cold weather makes naphthaline very readily. Our greatest difficulty, however, is not in the extremely cold weather, but when the winter sets in. We are not troubled with it very much about our works, but outside of the works for a distance of half a mile is where we get the most. We do manage to keep the naphthaline out of our works, but when it travels from cold pipes to pipes that, perhaps, lay in low, damp ground, the naphthaline accumulates to a large extent, although I am happy to say it has not troubled us to the extent that it seems to trouble people in Hamilton at the present time. Another additional expense (I refer to it because it requires additional capital) is the furnishing of buildings for the storage of our coals. Our American brethren get their supply of coals in daily I presume, as they want them; but in Montreal we have to store 35,000 or 40,000 tons of coal for our winter's supply. Therefore, we have to purchase a great deal of ground on which to erect our shed. We do not pile our coals high in Montreal. We find we cannot pile our coals more than six or seven feet high. We build our sheds with open sides, with the roof sustained by iron columns, to allow a free circulation of air; and you can readily understand that it requires a great deal of ground to pile up, to a height of six or seven feet, 40,000 tons of coals. This is absolutely necessary with us, because we have not railroad communication with the mines, and have to lay in a sufficient supply in the summer season.

Mr. Shelton—The reference by Mr. Scriver to the cold weather recalls an experience that I had last winter, in which I used a substitute for coke to enable us to get at the pipe beneath the ground, at a low temperature, where the street was very badly frozen. I used slacked lime. I had read of this remedy, I think in the American Gas Light Journal, and finding a pipe stopped about four o'clock one afternoon (it was too late to clear it that night), this idea occurred to me. I therefore took off from over the pipe some four or five inches—just a crust of earth—and then put a couple of bushels of lime in the space, poured water over it and slackened it, and then put canvas over that and rocks on the canvas so as to keep the wind from getting underneath. Next morning on returning there I found that the frost had been drawn out from the ground for nearly three feet. You can appreciate what an advantage that was; for picking through frozen ground with the thermometer below zero, is no joke. Since then we have tried it several times. It is an excellent plan if you have time enough to let the lime work. In the daytime you cannot afford to waste the time; but if you have a spare night in which to work it is worth while to try it.

Mr. Slater—I presume, Mr. President, you and all the members of the Association have missed Mr. Littlehales at this meeting. I understand he has some trouble from naphthaline in the inlet or outlet of the holder. I move the Secretary be authorized to send a telegram expressing our regret that he is not here, and our sympathy for him in his trouble.

Mr. Pearson—I have a letter from Mr. Gates, the President of the Hamilton Gas Company, regretting his inability to be here on account of some difficulty at the works and wishing me to convey his regards to you.

Mr. A. C. Humphreys—I do not think that in the States generally we experience any such trouble from the cold weather as they do in Canada, but I believe that, scattered all around in New York, New Jersey, and on that line, they do have a great deal of trouble. It has occurred to me a number of times, whether we do not have more trouble, especially from broken pipes and started joints, where the frost line and the pipe keep intersecting. In other words, the pipe is dipping down, going down and then coming up again; it goes first through a piece of frozen ground, and then through a piece of ground not frozen. I would like to ask how Mr. Baxter provides against the expansion and contraction where they have these turned and bored joints; and also how he provides for crossing bridges, where the pipe is absolutely exposed, coming out of the frost line, going into the air, and then back again. We have several means of providing for that in our own works, and I would like to hear how it is done elsewhere.

Mr. Geggie -In passing over bridges we put our pipe in a box, and try to protect it as well as we can. That is the only thing we can do.

Mr. Scriver—In Montreal we do not happen to cross any bridges, but have to go underneath the canal, and one or two creeks. Instead of running pipes across a bridge we go down underground. The joint that we use is the double-joint. We use the turned and bored joint also. We believe it is the best joint we can have.

Mr. Robert Baxter—I can say, in reply to Mr. Humphreys, that we have no trouble at all from the contraction and expansion of the joints. We rarely have a leaking joint. We use no protection against it. We do not run over bridges and have no trouble with joints drawing apart.

Mr. Starr—We sometimes have the temperature down as far as 30° below zero, and it is often down to 18° to 25°. I have been frequently troubled by the frost. I used to have a great deal of trouble with my lamp posts. Before I overcame that difficulty I would sometimes have one half my lamps frozen up every night. In the summer I took them out, dug up the lamp posts, and put in an 1¼ inch pipe. I had a three-quarter inch pipe there before. I run a service pipe around the pipe in the lamp post, four feet high, and since then have rarely had a frozen lamp. With the larger pipe the gas goes through it without any trouble from frost. In regard to frozen holders, I will say I have had trouble of that kind. Our holder is exposed, uncovered; but I put in iron brackets; extending three inches from the holder, and on them I put two inches of plank between the wall and the holder; and that goes within an inch or two of the holder. In the fall of the year I put a little manure around there, and then I have no trouble at all. I build up my wall about three feet above the holder. That may have been another protection. At any rate I am no longer troubled with the frost.

Mr. Pearson—In carrying pipes across a bridge we put them in a box, and pack it with sawdust. It is a very rare thing that any of the pipes freeze. When they do freeze it is generally just where the gas enters the pipe between the ground and the box—just at that particular point. But we have very little difficulty because of the frost. We had one pipe across the bridge all winter (not enclosed at all) that did not freeze. Of course our climate is not as cold as that of Montreal or Quebec. In fact, it is not much colder here than it is in New York State. We have very little trouble of that kind in the street—seldom having a frozen pipe; but we do have a tremendous number of frozen connections in the houses, by reason of neglect. We use methylated spirits for thawing them out, and they very soon yielded to the application. We tried whiskey, but found that about as much whiskey went down one way as the other, and we decided to give that up.

Mr. Starr—We have two bridges over which we carry a pipe, and where the pipe goes down perpendicularly two or three feet to the ground, I surround the pipe by an oak box ten inches square, and never had any trouble with frost until last winter. I then discovered that a team had run against the pipe and broken the box. The box was all rotted down to the bottom. The wooden box has always kept the frost from the pipe.

Mr. Lindsley—With reference to the matter of pipes passing an exposed situation, as over bridges and the like, I will say we have a case in our town that may interest some of the members. We have a stone structure on one side of the river, 2,300 feet long, and the pipes which serve the lamps run along that, just inside of the parapet, resting in a ledge or box which had a foot of earth covering it. It was rather a trying situation for a small street pipe. The distribution on each side commenced with an inch and a half, and ended with a one-inch pipe. In that part there are about 28 lamps. Those pipes were laid in a box an inch wider in size than the diameter of the pipe, and the space filled in with ordinary coal tar pitch. During some six years they were in use not a lamp service was frozen in that district—that is, to be frozen out; and it is a very rare thing, even in what zero weather we get there, to be troubled in that way.

Mr. Nettleton—Mr. Humphreys stated that this company had their own method of dealing with pipes on bridges. A good many of us are interested in that subject and have had trouble from frozen pipes thus exposed; and so I would like to ask him what his method is.

Mr. A. C. Humphreys—We simply take and expand the pipe before it leaves the ground. If it is an eight-inch pipe we expand it to twelve inches; carry it up to the ground and across the bridge at twelve inches; if you cover it with canvas it is so much the better; but I do not think it would freeze without covering. The degree of expansion must of course be governed by the climate. I will say we were led to that by the experience I had years ago in my first work, where we connected up lamp posts (we had a great deal of trouble with frozen lamp-posts) in the same way, with expanded pipes. If it came in with a three-quarter inch we expanded it to an inch and a half. We originally started at two inches, but found that unnecessary. We ran up past the frost line with this inch and a half and then reduced it to one inch pipe. We never had any trouble with those posts after we put in those "anti-freezers," as we call them. We have had the criticism made sometimes that the thing failed, but on investigation we invariably found that the frost was not in the post; it was in the service. We introduced the same thing in all our different works, and had the criticism from some in the West that it did not answer the purpose; but I think there is no one now who does not say it is all right. In Omaha you must have a larger expansion pipe than in New Jersey or Washington.

Mr. McMillin—What good does the expanded pipe do?

Mr. A. C. Humphreys—It gives you greater capacity for freezing before you have trouble.

Mr. McMillin—That is the chief thing, I suppose?

Mr. A. C. Humphreys—No; I do not think it is. If you open the pipe I do not think you will find the frost there; certainly not any depth of it. If you measure it you will not find the same quantity of frost collected in a given time. And, of course, you carry it over in better condition across the bridges. Instead of reducing it or even holding it at the same pressure, we give it a chance to expand wherever the pressure comes, as just at the point of passing through.

Mr. Douglas—I think I can give an experience of this kind. We had a pipe extending on top of the rock for about a mile, but before going on the rock it had to cross a bridge for 50 feet. We could not get any gas at all through that pipe for winter after winter, and they had to abandon the gas light. I was not in charge of the works, but was able to assist the man who was, and I suggested to him to expand the pipe, so as to let the water in the gas be deposited in the form of hoar frost; and the remedy was effective. Just make room for that hoar frost to deposit, and there will be no further trouble. They continued supplying gas, carrying the pipes over snow and ice, and never had any further trouble.

Mr. McMillin—I have two lines of 16 inch pipe crossing bridges 300 feet long, and in one instance, for perhaps 15 or 20 years before I had charge of the works, during cold weather, the men were instructed to go every day with a barrel of hot water and pour it down one of the pipes at the point where the upright pipes rise to cross over the bridge. The difficulty was always there, of course. To avoid that expense, and at the same time to give them a more uniform service across the river, I tried placing an 18 inch pipe on the outside of the 16 inch pipe, filling the space in with felt. That passed up to the top of the bridge girder, 5 or 6 feet above ground, and then I covered it for 10 feet further with sheet iron—the covering getting thinner as it grew in length, so that at the end of it there was no covering at all except the sheet iron. My whole object was to cause the deposition of what moisture there was in the gas, and also of any of the rich hydro-carbon that would not stand the frost, to spread over as much territory as possible, and by doing that we have never had any trouble with the bridges from that time to this. There was one winter when for three weeks it was 25° below zero, but we had no trouble on the bridge where the pipe laid on the top girder, five or six feet above the floor, exposed to the weather, and covered with nothing except a coat of paint. Although I should not anticipate any trouble from the lamp-posts in the case Mr. Lindsey speaks of, yet I might expect the main to be cut off where it comes up out of the ground into the frost. As to passing along that way for some distance, I would not expect any of the lamp services to freeze, as by that time the moisture is all deposited, and the heavy hydro-carbons which will not stand that temperature have gone down before they reach the lamp-post. I have in mind another bridge, 180 feet long, which carried over a gas pipe that I never knew to freeze up. There were lamps on both ends of the bridge, and the main, which came out under the bridge in a very cold place, was exposed for 10 or 15 feet, and then ran up above to where there was a meter set; and the supply pipe going across the bridge was three-eighths of an inch, but I never knew it to be frozen up. So that it is not altogether dependent on the size of the pipe. It is a good deal in dropping your moisture and other material.

Mr. Starr—Which of the bridges was the farthest from the works—the one with the small pipe or the one with the large pipe?

Mr. McMillin—I think they were about equally distant, 1,000 or 1,500 feet; but in either case the gas would have traveled probably 3,000 feet from the works.

Mr. Slater—It is amusing to notice the different conclusions at which we arrive from our experience in the same line of work. I recollect that Mr. Geggie, acting on his experience, has adopted the lead joint altogether; while from our experience at Providence we have pursued exactly the opposite course, as we use the cement joint, for the reason that the continual expansion and contraction of these pipes cause a great many leaky joints. With rigid cement joints we do not have leaky joints at all. If we have anything, we have broken pipes, which is reported immediately after breaking, so we can promptly repair it. If we used lead joints we would have a great many leaky joints, and they would not be reported at all unless they were very bad. In the case of bridges, we always go over them—come up out of the ground and go over the bridge with a boxed pipe. We have quite a number of railroad bridges where the pipe was formerly put underneath, but we found that with the trains running every few minutes we could not readily get at them to make repairs if they happened to spring a leak, whereas by putting the pipe over the bridge we can take care of it at any time.

The Association then adjourned, to meet on the following day at 10:30 A. M.

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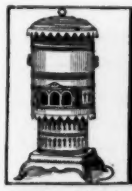

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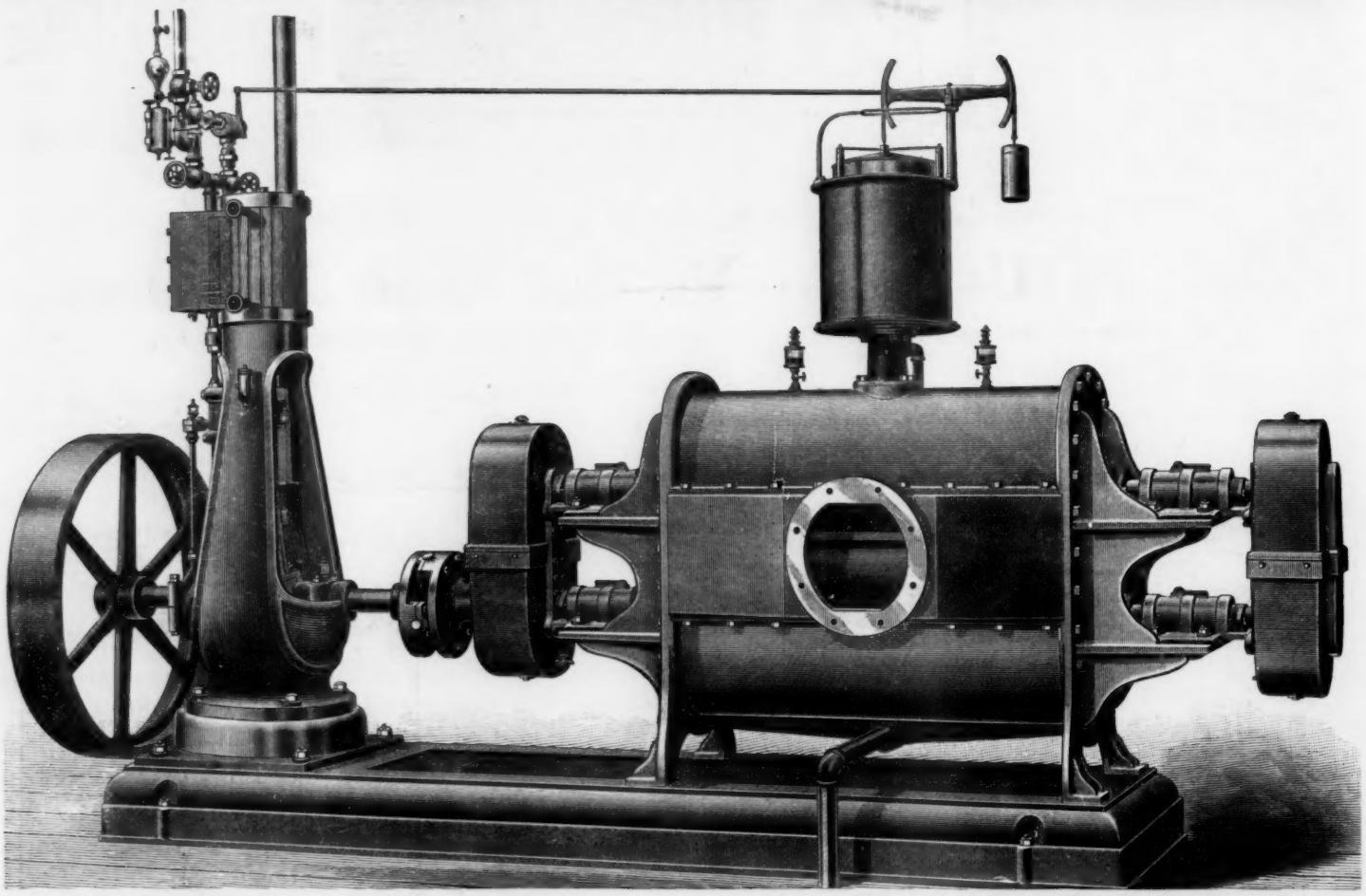

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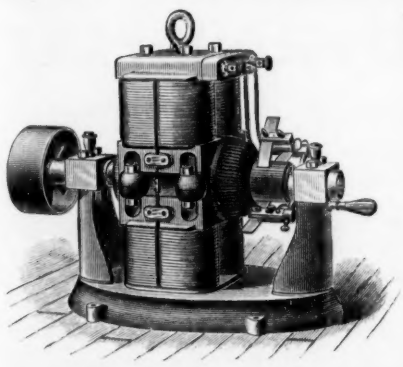

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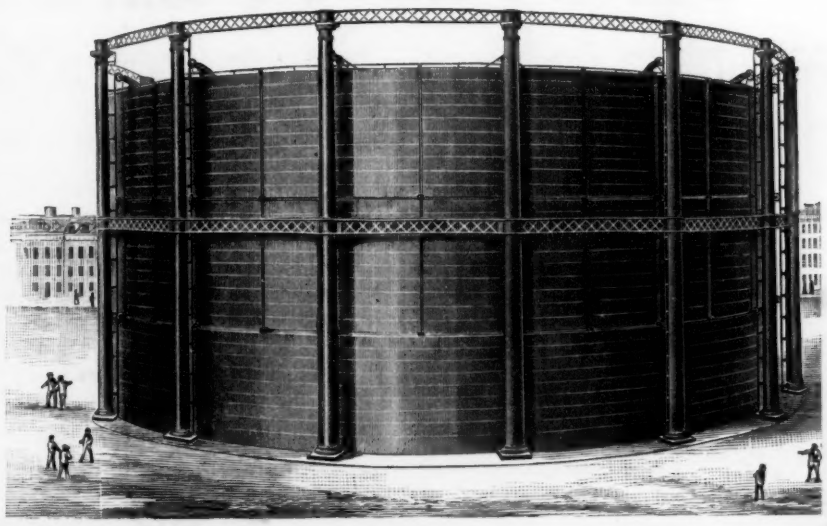

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The following Engineers have personally given permission to refer to them:

G. C. Trewby, Esq., Engineer-in-Chief of the Gas Light and Coke Co., London. The manufacturing plant at Beckton is built in complete sections of 3,000,000 cubic feet capacity each. A Walker Tar Extractor has been fi ted to each one of these sections. This was done after a long and thorough trial on one of its sections. The Tar Extractor has been supplied to other works of the Gas Light and Coke Co., including those of which John Methven, Engineer of the Gas Light and Coke Co. at the Nine Elms Station, is in charge. Also to G. E. Stevenson, Peterborough Gas Works; B. Green, Mitcham and Wimbledon Gas Works; W. H. Smith, Bedford Gas Works; F. Linging, Norwich Gas Works; J. T. Browning, Colchester Gas Works; S. B. Darwin, Portsmouth Gas Works; J. McCrae, Dundee Gas Works; W. J. Wells, Stamford Gas Works; J. M. Darwin, Longton Gas Works; J. Paterson, Warrington Gas Works; and J. Coulter, of the Dundalk Gas Works. All of the foregoing gas works are located in Great Britain.

Mr. Charles A. Gerdenier, Superintendent of the Bridgeport (Conn.) Gas Light Company, writes as follows, under date of Dec. 3, 1887:

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No. 3,	"	"	250,000	"	"	"	5	"	"	" "
No. 4,	"	"	500,000	"	"	"	6	"	"	" "
No. 5,	"	"	750,000	"	"	"	7	"	"	" "
No. 6,	"	"	1,000,000	"	"	"	8	"	"	" "
No. 7,	"	"	1,250,000	"	"	"	9	"	"	" "
No. 8,	"	"	1,500,000	"	"	"	10	"	"	" "
No. 9,	"	"	2,000,000	"	"	"	12	"	"	" "
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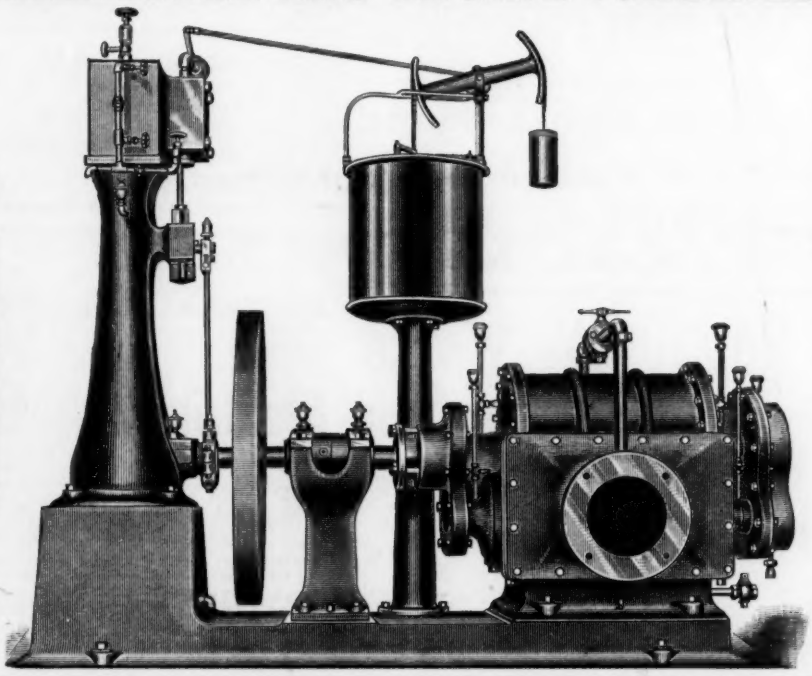

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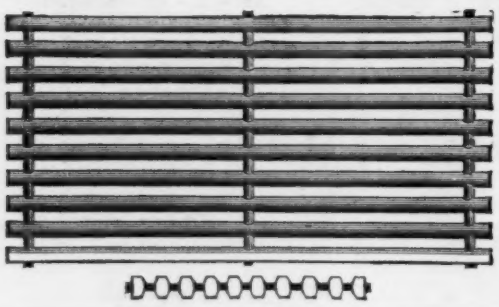

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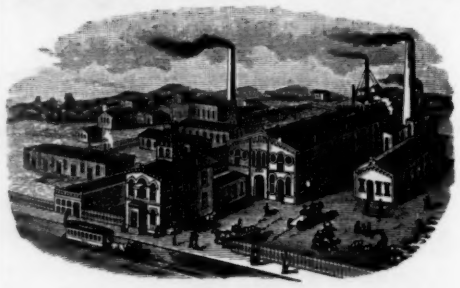

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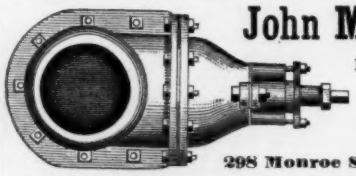

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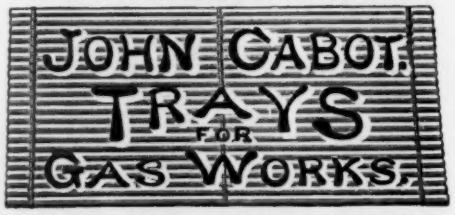

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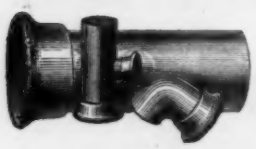

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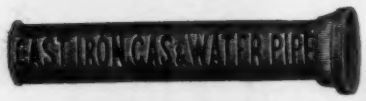

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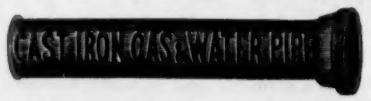

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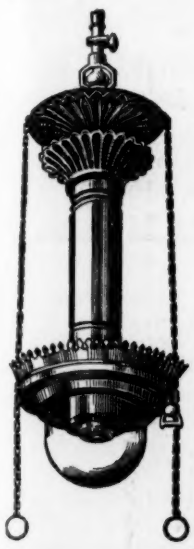

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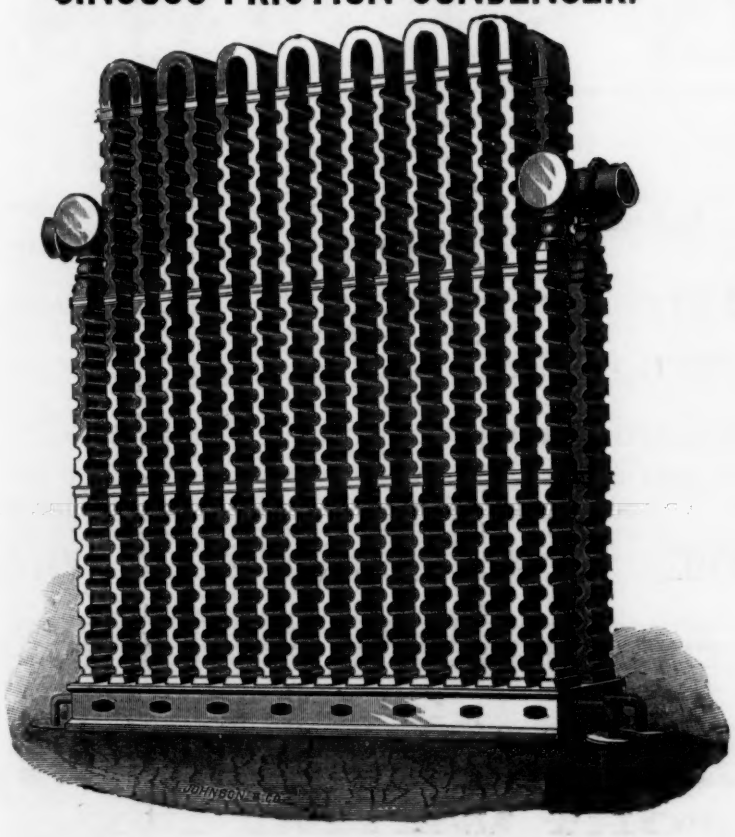

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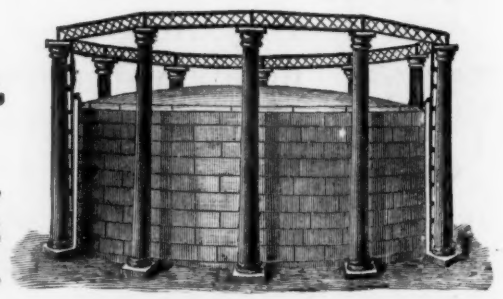

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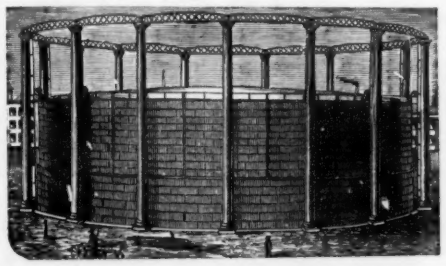

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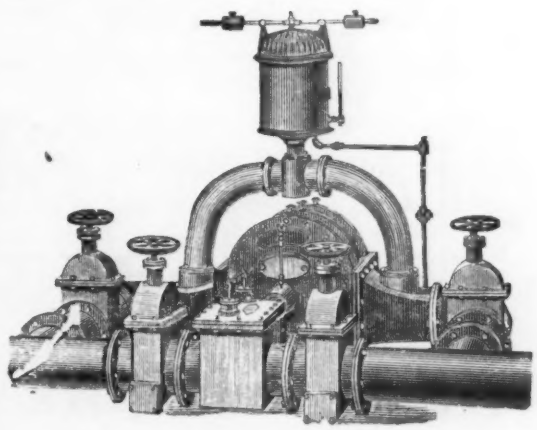

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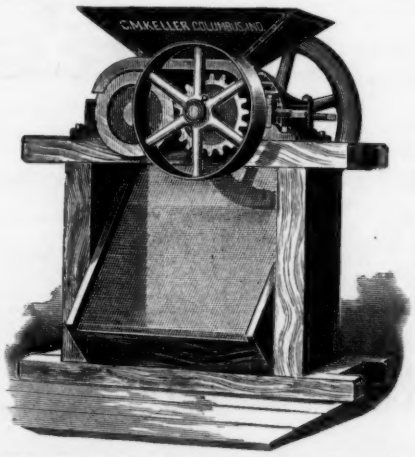

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SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
37 in. high.	12 in. high.	12 in. high.	24 in. long.	36 in.
20 in. wide.	17½ in. wide.	18 in. wide.	21 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has four burners on top, and double oven burner.

Consumption of gas with all burners in use, 42 feet per hour, at 1 inch pressure.

The top is made in sections, so that a greater variety of cooking utensils may be used. By lifting out the covers and crosspieces and putting in a suitable forked ring, which is sent with each stove, a wash boiler or other large utensil may be set over two burners. Our **No. 87 GRIDDLE** also fits in the same position. The roasting oven is provided with a cast-iron door.

All Fittings are Nickel-Plated.

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SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
31 in. high.	9½ in. high.	10 in. high.	21 in. long.	32 in.
17 in. wide.	14½ in. wide.	15 in. wide.	16 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has three boiling burners in the Top or Hot Plate, and one single oven burner.

This cut represents our New Style Cooking Stove. As will be seen, it has an ornamented cast-iron Base and Front, and extension shelves. The Oven Burner, which is atmospheric (unless otherwise ordered), is of an entirely new and improved pattern (patent). The ovens are of greater capacity than those of the old style. The Top, in conjunction with the Outlet Pipe, is designed to carry off all the products of combustion, if desired, but they are also supplied with a loose ring which converts it into an ordinary open top stove.

The consumption of this Stove is 35 cubic feet per hour at 1 inch pressure, with all Burners in use.

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Size, 6¼ inches diameter, 8 inches high. Consumption, 6 feet per hour at 1 in. pressure.

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